VOL. XXVIII NEW YORK—THURSDAY, January 16, 1913—CHICAGO No. 3

The AUTOMOBILE
COMMERCIAL VEHICLE ISSUE

Addition of Models Features Gasoline Truck Development

Radical Changes in Design Are Few—Stronger Construction Distinguishes the Models for 1913

NUMBERS OF VARIOUS CAPACITIES

1000	1500	2000	3000	4000	5000
34	45	60	41	48	5
6000	7000	8000	10000	over 10000	
55	12	20	45	14	

IGNITION
Single—110 Dual—215 Double—51

IGNITION CONTROL
Fixed—65 Hand—248 Automatic—56

COOLING
Water-Pump—270 Water-Syphon—84 Air—30

CLUTCHES
Cone—161 Disk—195 Band—7

GEAR-BOX LOCATION
Amidships—222 Unit Motor—78 Unit Jackshafts—75
Unit Axle—4

STEERING WHEEL
Right—257 Left—118

REAR AXLE BEARINGS
Roller—245 Ball—98 Ball and Roller—25 Plain—4

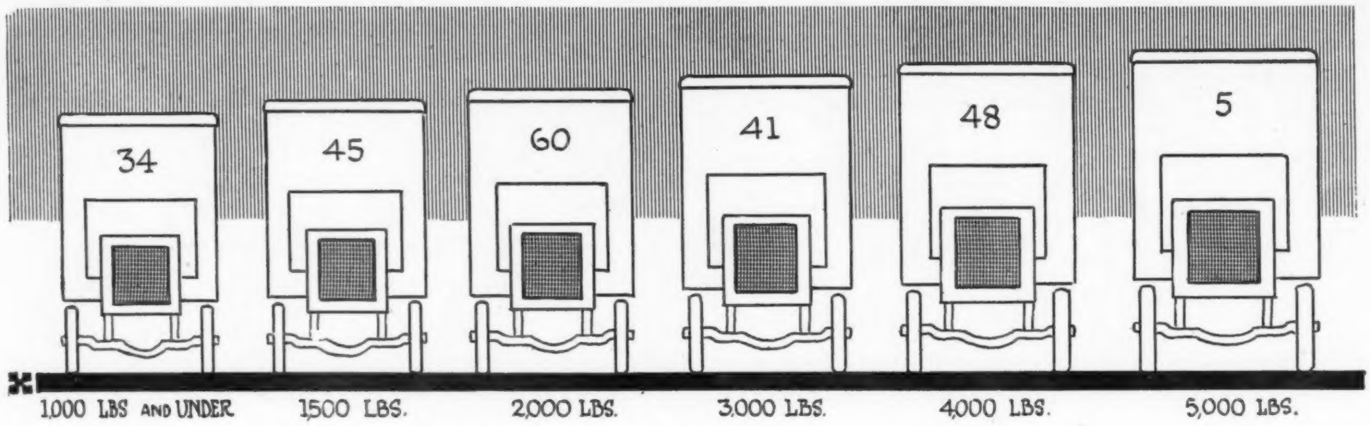
METHOD OF DRIVE
Chain—317 Worm—7 Bevel—53 Internal Gear—10

A Full Account of the Opening of New York's Thirteenth Annual Show Given on Pages 218 to 230

THE forthcoming annual New York truck show which will open its doors to the public on January 20 will be the most representative that has ever been held. The exhibits will be staged in Madison Square Garden and the Grand Central Palace laying bare to an expectant public the offerings for the ensuing season. There have been numerous refinements made in body construction during the last year, as well as improvements in the methods of expeditiously dumping heavy loads. According to present indications this is a year of refinements rather than changes.

Comparing the statistics that have been furnished by makers of gasoline commercial vehicles for the coming season with those of last year there is a decided tendency on the part of a good proportion to increase the number of models manufactured. In cases where a small model was manufactured last year one or more chassis of heavier carrying capacity have been added to the line, and in not a few cases the makers of heavy duty trucks having found that they were losing business with concerns to whom they had sold the large trucks when these customers came to buy trucks of smaller capacity which they did not make. A competitor by this means obtained the footing in some cases equally as strong as the pioneer manufacturer. Besides the question of additional models the subject of overload has been met by many of the manufacturers in the following manner: Without directly stating or guaranteeing that their trucks will withstand any specific overload over and above the rated capacity they nevertheless appreciate the fact that at times the trucks may be inadvertently overloaded or undue strain may be caused by circumstances beyond the control of the owner or his driver. Consequently, the chassis frames, axles and steering gears, have in many cases been strengthened to take care of additional strain.

It is somewhat confusing to consider trucks as built according to yearly models; as far as the truck business is concerned this never was the case; improvements may have been added during the preceding year that have not been announced prior to the show time, and, again, certain types of models have been purposely withheld until the event of the show in order to present



Showing the numbers of truck models of different capacities up to 5,000 pounds

them to the buying public when its mind is in a receptive mood. The date of manufacture of the truck and its designating model title are the only points that manufacturers consider. Such things as modes and fancies do not enter the commercial field and so cause to be discarded what otherwise might be good.

The much-debated question of motor under the bonnet or motor under the seat has not materially changed in aspect during the last 12 months. Between thirty and forty vehicles have remained unchanged except perhaps insofar as relates to minor details.

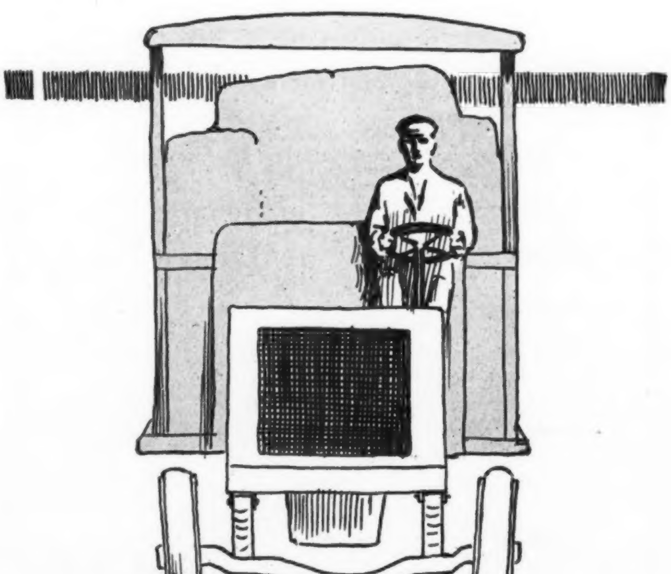
One hundred and sixty-four commercial vehicle makers of gasoline trucks responded to calls for specifications, and out of this number there was a total muster of 409 chassis models. This shows a growth of eighteen new makers listed as compared with 1912 and an addition of eighty-eight chassis models. When it is taken into consideration that such concerns as the Franklin, Mitchell, Cartercar, Case, Lozier, Interstate, Premier, Hudson and Ohio, as well as a few others, have discontinued the manufacture of commercial vehicles, the list of new makers must be correspondingly increased in order to make up the sum total given above. Some of the concerns who have entered the commercial vehicle field during the last year are: Stewart Corporation, Stewart Iron Works, National Motor Truck Company, Nordyke & Marmon, Motor Car Manufacturing Company, Standard Motor Truck Company, Gramm-Bernstein Motor Truck Company, Krebs Commercial Car Company, KaDix Newark Motor Truck Company, White Star Motor & Engineering Company, Driggs Seabury Ordinance Corporation.

The general characteristic features of truck design have undergone very little change during the last year. There has been a general cleaning up on the part of the majority of manufacturers and it is safe to say that the year that has passed besides being a good one for the truck business in general has been extremely educational as several of the trucks that are in operation have passed from the stage of new toys to everyday necessities and have shown themselves in their true light. If the result was a good one the manufacturers have themselves to congratulate upon their success, but if real dissatisfaction or even indifferent results were met with in certain quarters, lessons learned will act as a guide to prevent the recurrence of such mistakes.

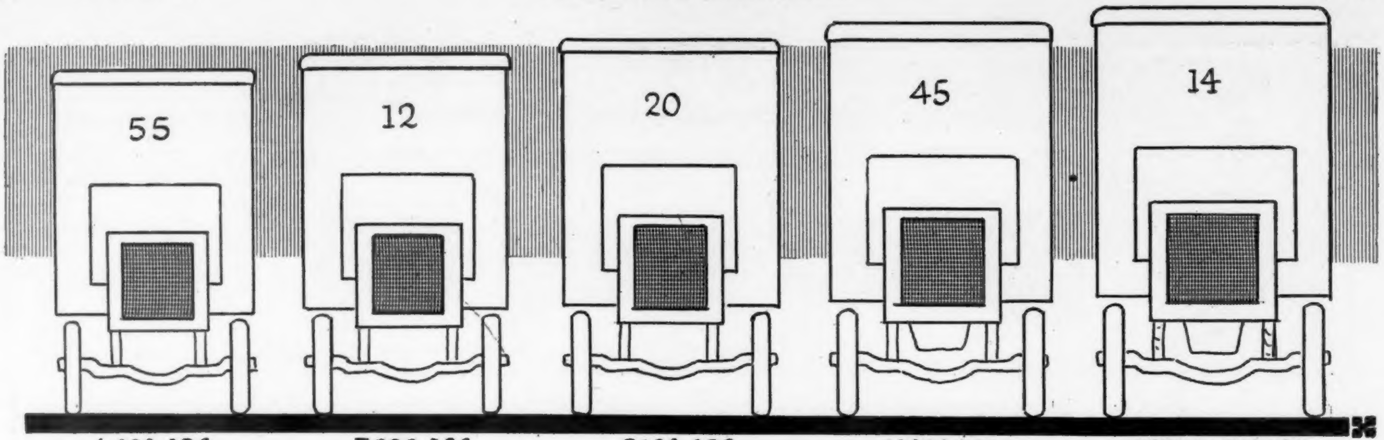
Reference has already been made to the position of the motor and the same remarks apply to the general mechanical features of the motor as well. Very little has been done along the lines of changes and in another part of this issue of THE AUTOMOBILE a series of curves is given, showing the S. A. E. horsepower, the bore and stroke, as well as the piston displacement for the various makes. In order to arrive at a common basis of comparison, the useful load capacity in pounds has been divided by the piston displacement in cubic inches, thereby giving the ratio of useful load in pounds per cubic inch of piston displacement. It would be impossible to attempt to closely analyze the figures that this calculation affords, as the question of the efficiency of the engine is entirely disregarded as well as the engine speed and a number of other considerations which are not to be neglected.

The clutch has received very little alteration at the hands of designers of trucks; in figures compiled of percentages of this and last year's models there is a slight tendency towards an increase of favor of the leather-faced cone-type clutch in preference to the disk or band types. Provided the area of the contacting surfaces is sufficient and the degree of the angle of the male member suitable there is no reason why the cone type of clutch will not give most excellent results. Its co-efficient of friction is in many cases increased by the addition of cork inserts. Its great feature is its simplicity.

Gear-box location seems to be a point upon which the different makers have various opinions as is indicated by the number of concerns building the various types. Out of the total number who have responded 222 chassis are fitted with the transmission gearset amidships, the power being delivered from the clutch to the gear-box and thence to the differential, usually by universal-jointed shafts, leaving the transmission an entirely independent unit. In seventy-eight chassis the transmission is attached to the rear end of the crankcase housing, thereby forming a unit of the motor and transmission. In seventy-five chassis the transmission and differential form a unit with the jackshaft housings in the case where chain drive is employed. The number of trucks using rear axle and transmission unit combination is extremely small.



Out of a total of 375 truck models there are 118 with the steering on the left

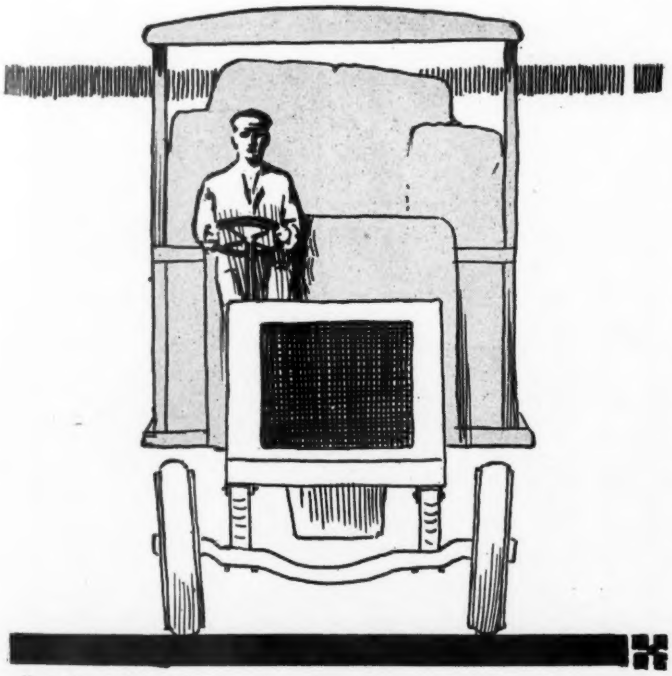


Showing the number of truck models of different capacities from 6,000 pounds upwards

One of the principal features of truck design that has been carefully watched by both manufacturer and purchaser has been the question of worm drive. Credit must be given to the pioneer of this class of drive in this country, namely the Pierce-Arrow, and this coming season will see more converts among whom may be mentioned the Smith, Diamond T, Universal, Blair, Schacht and Wolverine. The Smith trucks, of 3.5 and 6-ton capacities, both use worm drive, the Schacht has worm drive fitted to its 1-ton model, the Blair is being built in three models, of 1.5, 2.5 and 3.5-ton capacity with worm drive as well as the Universal Motor Truck in its recently announced 1-ton model. The Wolverine Detroit, a 1,000-pound wagon, is also fitting worm drive to this season's models.

The question of the suitability of steel wheels has not been much debated in America and it is somewhat surprising that this type of construction has not gained more headway. Three prominent concerns, namely the White, Smith and Locomobile, are using steel wheels as a standard in all their models for the coming season.

The chain still claims the premier position as the means of final drive in all carrying capacity models. Out of the total number 317 chassis are fitted with chain, fifty-three with bevel drive, seven with worm drive and ten models with internal or external gear drive. A new type that is making its appearance this year may be mentioned, namely, the Walters, built along


Out of a total of 375 truck models there are 257 with the steering on the right

the lines of the French Avant-train Latil, which opens up a means of utilizing existing horse wagons, thereby saving considerable loss when these have to be sold for what they will fetch to make room for conventional gasoline or electric truck.

There is a preponderating majority in favor of roller bearings for use in the rear wheels, there being 245 chassis fitted with roller bearings as compared with ninety-eight chassis fitted with ball bearings. Ball and roller bearings are fitted to twenty-five chassis and four chassis are fitted with plain bearings. These latter are in most cases of small carrying capacity. While it is possible to make heavy trucks with plain wheel bearings, the problem of lubrication and the damage that may be caused by want of lubrication have seriously retarded any decided efforts in this direction. Ball bearings of the annular type alone without any provision for end thrust do not give satisfaction after a certain load has been reached, despite the fact that the balls are large enough and proportionate to the load. The adaptability of the roller bearing to carry the load and take end thrust makes it particularly adaptable for truck work as is indicated by the number of manufacturers using it.

Dealing closer with details of design, the method of cooling claims the premier position. There are 270 models using a pump to circulate the water, which shows a 5 per cent. increase over last year's figures, eighty-four models using the thermo-syphon system, and thirty models who rely solely upon air. The majority of these latter have two-cycle motors.

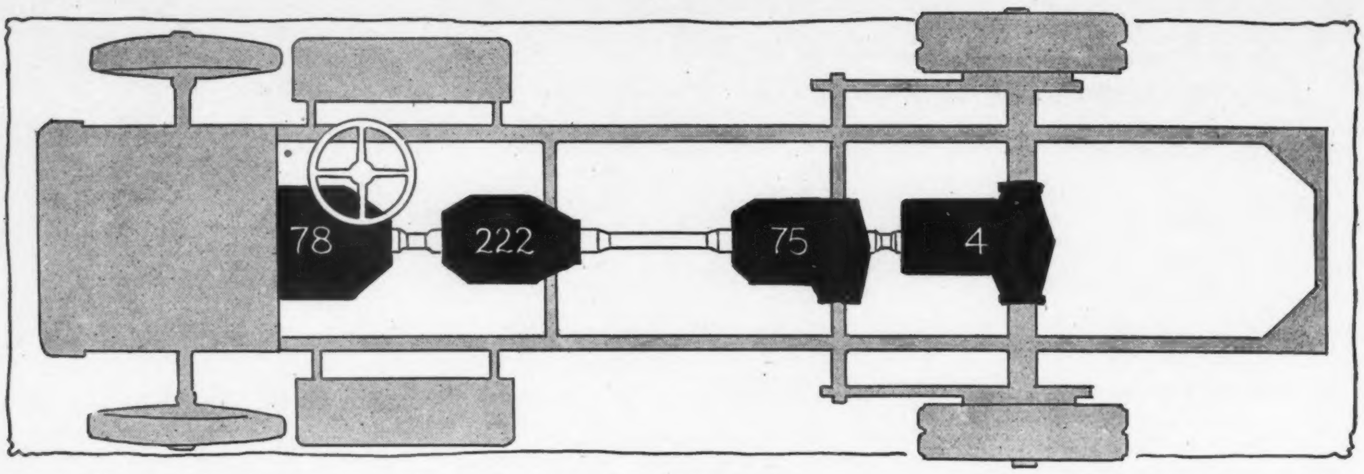
Approximately five-eighths of the total number of chassis listed employ dual ignition, there being 246 of this type. The remaining three-eighths are divided into 110 models, using single ignition and fifty-one models employing two independent sets of ignition classified under the heading of double ignition.

Governors are being fitted to an increasing number of chassis. The point at which these are set to operate being largely dependent upon the carrying capacity of the vehicle.

The 3,000-pound wagon has its speed restricted when a governor is fitted, in many cases to 15 miles per hour. The 6,000-pound wagon has its speed regulated to 12 miles per hour, and the 5-ton truck between 8 and 10 miles per hour. There is no doubt that there is an increasing tendency toward the fitting of some means of controlling the speed of trucks, the unanimous opinion being that a governor will satisfactorily control the maximum speed while traveling along the level of high gear. When it is necessary, however, to increase the engine speed on the lower gears in order to extricate a truck from bad ground or heavy sand, the restriction with the governor sometimes acts in a detrimental manner.

While the left-hand drive type of vehicle is gaining favor there is still a considerable number of right-hand driven vehicles in excess of the first mentioned type. Out of 375 chassis there are 257 which have the steering wheel placed on the right hand side of the vehicle, and 118 with the steering wheel on the left.

As an indication of the enormous growth of the truck busi-



Showing the trend of gearbox location in the various models of trucks for the coming season, showing the numbers with various locations

ness the plans for next year in most cases show that the number of vehicles manufactured will be two or three times that of 1912. It is a well-known fact that the sales of 1912 were at least 100 per cent. more than 1911.

Among the changes and additions that have been made recently may be mentioned the following:

ADAMS—In addition to the 1 and 1.5 models a 2-ton vehicle known as model E has been added, following the general lines of last year's models. The new models will be equipped with a 30-horsepower motor and a change has been made to a multiple-disk clutch. The wheelbase of the new model is 140 inches and springs 50 inches in length will be used at the rear.

ALCO—No new models will be brought out by the American Locomotive Company during 1913. Most of the improvements in the 1913 models were incorporated in the 1912, including a new steel quick-acting service brake lined with a high-friction lining in place of the locomotive type brake; the driving sprockets have been made removable. A specially designed drive plate clutch and a new carbureter with an adjustment on the dash have been incorporated as well as an alteration to the driver's cab, square section spokes for the rear wheels and a strengthening of the bumper.

ATTERBURY—The Atterbury Motor Car Company has increased the number of models, having added a 1,500-pound wagon with internal gear drive, and a 1.5-ton truck to its existing line of 1, 2, 3 and 5-ton trucks.

AVERY—A 1 and a 5-ton truck have been added to the previous models manufactured. The entire line being fitted with governors. One of the features of the 5-ton truck is that the seat and foot boards over the motor can be tipped forward, thus offering easy accessibility. The disk clutch has been modified, twelve pins being used instead of six as heretofore.

BESSEMER—In addition to the 2,000-pound capacity chassis manufactured last year, 2 new models have been added, namely 1,000 and 3,000-pound capacities. Some minor changes have been made.

CHASE—The most recent addition to this line is the 500-pound wagon. The difference between this model and the 1,000, 2,000, 3,000 and 4,000-pound chassis is that it is left-hand driven instead of right hand, as is the case in the larger models.

DART—Two entirely new models are being placed on the market this year, one of 1,500-pound capacity and the other of 2,000 to 3,000-pound capacity. These trucks will both be four-cylinder left-hand drive and center control. The former will have a cone clutch and the later multiple disk clutch.

FEDERAL—No changes have been made in the design of the Federal 1.5-ton truck. One of the features of this car is that it is fitted with a governor restricting the speed to 15 miles per hour.

GARFORD—In the near future a new 2-ton truck will be added to the existing line of vehicles which consist of 1.5, 3 and 5-ton trucks manufactured at present. The 1913 line includes 2, 3, 4, 5 and 6-ton trucks, but the details of the 2-tonner are not yet available.

GRAMM—Three new models of the motor-between-the-seats type of 1, 2 and 3.5-ton capacities are being placed on the market for 1913. A feature of these trucks will be the Gray & Davis electric starter. The motor is attached to a subframe which is mounted on four coil springs, a governor being provided to restrict the engine speed to 1,000 R. P. M. The four-speed gearset is composed of individual dog clutches, the gears remaining in constant mesh. The specifications of the 1-ton truck differ from the other two in several points. A selective gearset is employed on the 1-ton truck, and the governor cuts out at 1,200 R. P. M.

B. A. GRAMM'S—These trucks are built in two sizes, namely of 2 and 3.5-ton carrying capacities. Both models are fitted with the same size motor, multiple-disk clutch, individual clutch type transmission, final chain drive.

GENERAL MOTORS—1,500-pound, 1.5 and 2-ton trucks have been added to the existing line for the coming season. Regarding mechanical improvements, the high speed is now direct instead of indirect, and a change has been made from multiple-disk clutch to cone clutch.

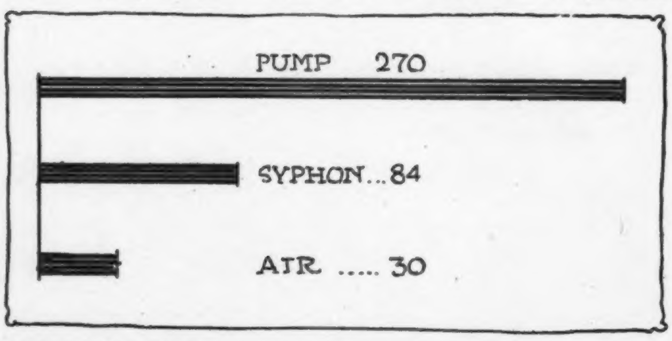
IDEAL—Manufactured by the Ideal Commercial Company, of Akron, O., the 1,500-pound capacity truck will be under the name of Akron. New mechanical features and improvements are mostly in the transmission. The clutch is automatically thrown out when the gears are shifted from one speed to another. This forms a foolproof mechanism.

INTERNATIONAL—The Mack, Hewett and Saurer trucks remain practically unchanged, except for some minor details. In addition to the other Mack models, a new 1,500-pound chain-drive model will be added. The specifications for this machine, however, are not yet available.

KADIX—This is a new make of truck and is being manufactured in four sizes. Namely, 2, 3, 5 and 6-ton capacities. The first two models have the motor under the bonnet and the second two have the motor under the seat. Spring suspension is employed in connection with the motor subframe and a straight-line driveshaft is used. There are several novel features in this truck, including the jackshaft housing, radiator suspension and brake mechanism.

KELLY-SPRINGFIELD—These trucks have changed air-cooled motors under the seat to water-cooled motors placed under a sloping bonnet. Two models at present manufactured are of 1 and 3-ton capacities, respectively. The steering is placed on the left and the control in the center. The motors are governed to 1,200 R. P. M. in the case of the 1-ton and 900 R. P. M. in 3-ton trucks.

KNICKERBOCKER—A 1-ton truck with a four-cylinder motor placed forward under a hood, selective gearset, and final chain drive has been added to last year's line which consisted of two models of 3 and 5-ton capacities, which will be continued this year practically unchanged.



Showing how the truck motors are cooled, comparing water-pump, water-centrifugal and air types

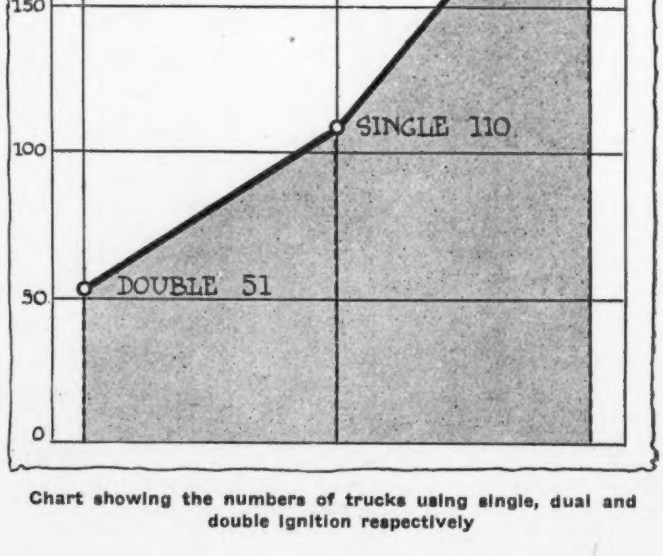
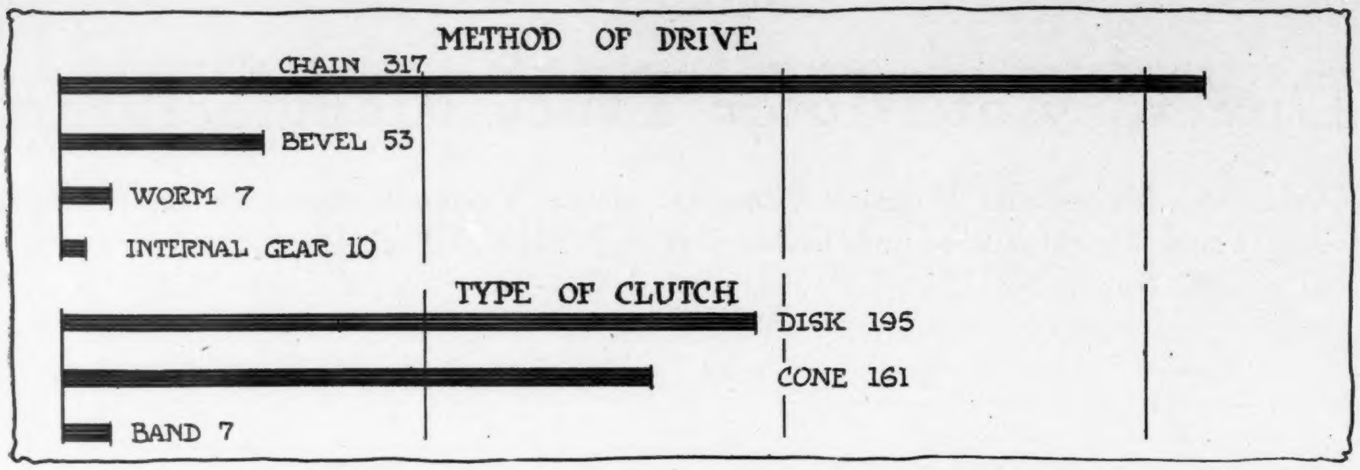


Chart showing the numbers of trucks using single, dual and double ignition respectively



Upper—Comparing the numbers of cars and the methods of drive. Lower—Comparison of the different types of clutches

KNOX—In addition to the Knox Martin tractor, only two models of conventional trucks will be manufactured next year. These being of 2 and 3-ton sizes. The chief mechanical changes over last year's vehicles consist of stronger steering gears and front axles, springs with flatter arch and sundry minor details.

LAUTH-JUERGENS—The latest addition to this line is the 5-ton truck. In order to take care of frame wearing self-aligning bearings are used in the jackshift housing. Coil springs have been incorporated, acting as shock-absorbers and relieving the main springs under full load. The hubs of the wheels are so constructed that a choice of four or five different bearings may be had, such as double row annular, parallel roller, taper roller and ordinary angular.

LIPPARD-STEWART—Quite a few changes have been made in the 1913 Lippard-Stewart, among which are the following: A 30-horsepower motor takes the place of a 22-horsepower motor hitherto fitted, a leather face cone clutch is used instead of a multiple disk. This is a separate unit, not being incorporated with the transmission. A new transmission has been fitted and the length of the rear springs has been increased by 5 inches. Full elliptic springs have given way to semi-elliptic springs, and, besides the length of the frame being made greater, the size of section has been increased. Steering gear, tires and gasoline tank have all been increased in size.

LOCOMOBILE—The 5-ton Locomobile which was placed on the market last year will be continued without any alterations.

McINTYRE—The design and construction of commercial vehicles of this make have been entirely changed. The line comprises a 1,000-pound chassis with a two-cylinder motor and 1,000, 1,500, 3,000, 6,000 and 10,000 capacity vehicles. Governors are fitted to all models and the design of motor, clutch and gearset of the 3,000 and 6,000 pound chassis is the same.

MAIS.—The principal change to be noted in the construction of these chassis is that all models now use pressed steel frames. Other changes are unimportant, being of a minor nature.

PACKARD—The latest addition to this line is the 5-ton model, which made its appearance during last season, shipments of which commenced about December 1. The only mechanical change from last year is in the ignition apparatus. An automatic magneto is now fitted.

PEERLESS—The 1913 trucks will not be different in any way from the 1912 product. These trucks are made in 3, 4, 5 and 6-ton capacities.

PIERCE-ARROW—The 5-ton model Pierce-Arrow continues to be the only model marketed by this concern. It is fitted with worm drive. The general design has not been changed.

PIGGINS—The Piggins is made in 3 capacities of 1, 2 and 3 tons. With the exception of a change of motor, the 1913 models are the same as 1912.

PLYMOUTH—Two new models of 2 and 3-ton carrying capacities, both equipped with a six-cylinder engine, are being placed on the market this year. The power is transmitted through friction drive.

REO—A four-cylinder model of 1.5 to 2-ton capacity has been placed on the market in addition to the single cylinder 1,500-pound truck. The motor is placed forward under a hood, and the final drive is by chain.

SERVICE—Two heavier models have been added to this line of trucks. Previously, carrying capacities were only 1,500 pounds and 2,000 pounds. The new models have carrying capacities of 3,000 pounds and 6,000 pounds, respectively. The mechanical improvements in the trucks include double spring suspended radiator, heavier axle construction and Grant roller bearings in transmission and rear axles, as well as S. K. F. self-aligning bearings in the jackshafts.

SMITH—There will be no mechanical changes over 1912. The principal features will be retained, including worm gear drive, herringbone gear transmission, cast steel wheels with hollow spokes, old mechanical parts pack of the motor and clutch, inclosed in dustproof cases and run in an oil bath. A three-plate dry disk clutch will be used, constituting the only mechanical change, except that the motor of the 3.5-ton vehicle is larger.

STEGEMAN—A new 1,500-pound delivery wagon will make its appearance this year, in which bevel gear drive takes the place of inclosed chains used on the large models.

SCHACHT—The 1912 models are being continued in practically the same form for 1913 and in addition to these there will be added a new 1-ton worm drive truck, also a 1.5 to 2-ton worm drive truck.

SPEEDWELL—To the line of 4 and 6-ton trucks, a 2-ton vehicle has been recently added, the same general design being carried out. Mechanical changes include a diagonal cross-member at the rear of the chassis frame and a new style jackshaft hanger which carries the forward extremity of the radius rods. Now the motor and transmission are hung from a subframe cushioned at the two forward points between double coil springs and is pivoted at two points in the rear. The front end of the frame is protected by a wood bumper and the starting-crank is made to fold. A new centrifugal governor has been added to all models.

UNIVERSAL—Announcement has been made of a new 1-ton model in which a Wallwork worm drive is incorporated. The motor in this chassis is placed under a hood in contrast to the larger types in which the motor is placed under the seat. A power hoist driven by a chain from an extension of the sprocket shaft is a useful innovation.

VELIE—A new 1-ton model has been added to this line and, instead of chain as is used on the larger models, shaft drive is employed. A governor is fitted on the 2 and 3-ton models, restricting the speed to 15 and 12 miles per hour, respectively. The previous chassis are unchanged.

WILLYS-OVERLAND—The 800-pound chassis has an increased wheel base, three-quarters floating axle, larger brakes and increased equipment, which includes a self-starter.

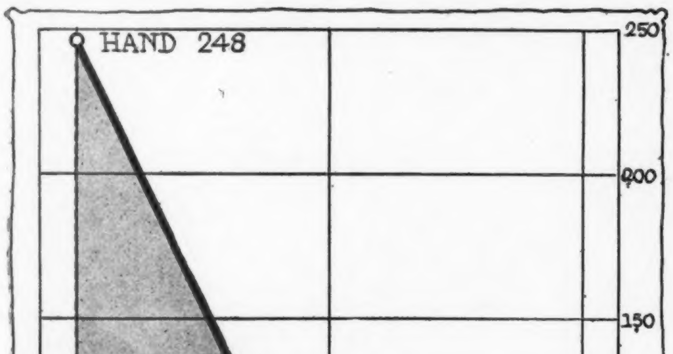
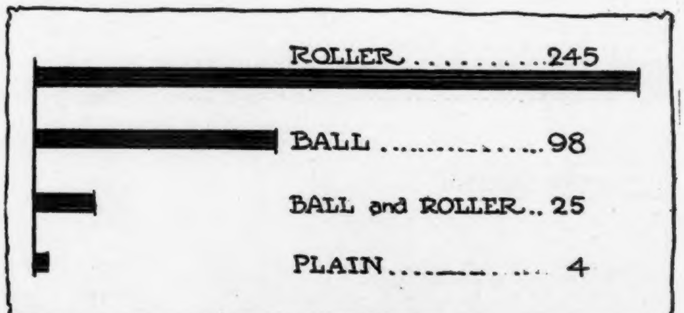


Chart showing the number of trucks and the methods of ignition control



Showing the numbers of trucks and the types of bearings used in the rear wheels

Directory of Motor Truck Manufacturers

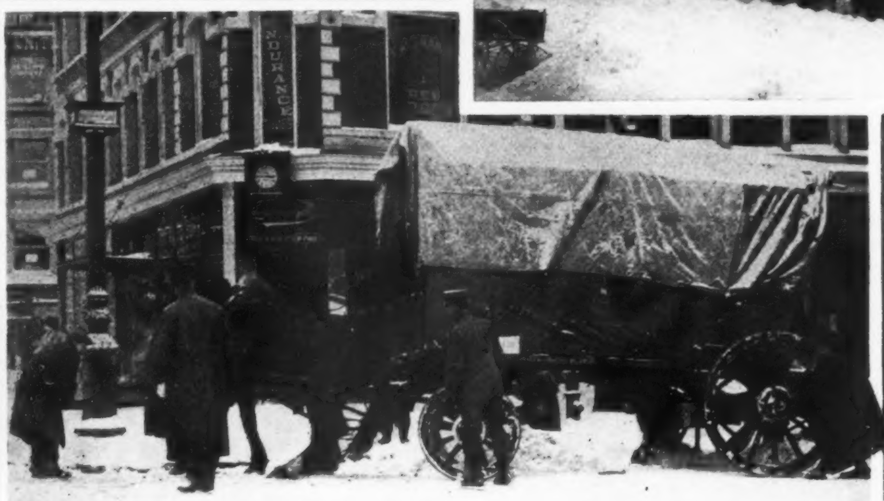
Giving the Names and Business Addresses of the Various Companies, the Name of the Truck Manufactured and the Number of Models of Each Load Capacity from 500 Pounds to 14,000 Pounds Included in the Line of Each Maker

COMPANY	ADDRESS	TRUCK	500	800	1000	1500	2000	3000	4000	5000	6000	7000	8000	9000	10,000	12,000	14,000
Abendroth & Root Mfg. Co.	Newburgh, N. Y.	A & R									1		1		1		
Adams Bros. Co., The	Findlay, O.	Adams					1	1	1								
American Locomotive Co.	Providence, R. I.	Alco							1			1			1		1*
Anglaize Motor Car Co.	New Bremen, O.	Anglaize				1	1										
Armleder Co., The O.	Cincinnati, O.	Armleder				1	1										
Atterbury Motor Car Co.	Buffalo, N. Y.	Atterbury				1	1		1		1				1		
Autocar Co., The	Ardmore, Pa.	Autocar						1									
Auburn Motor Chassis Co.	Auburn, Ind.	Handy Wagon	1	1													
Available Truck Co.	Chicago, Ill.	Available				1	1										
Avery Company	Peoria, Ill.	Avery							1		1				1		
American La-France Fire Engine Co.	Elmira, N. Y.	La-France														1	
Bergdoll Motor Co., Louis J.	Philadelphia, Pa.	Bergdoll				1											
Bessemer Motor Truck Co.	Grove City, Pa.	Bessemer			1		1	1									
Blair Mfg. Co.	Newark, O.	Blair						1		1		1					
Brooks Mfg. Co.	Saginaw, Mich.	Brooks		1													
Brown Commercial Car Co.	Peru, Ind.	Brown				1											
Babcock Co., H. H.	Watertown, N. Y.	Babcock				1											
Buick Motor Co.	Flint, Mich.	Buick			1												
Buckeye Mfg. Co.	Anderson, Ind.	Lambert				1	1		1								
Bowling Green Motor Car Co.	Bowling Green, O.	Modern			1	1											
Barker Mfg. Co.	Norwalk, Conn.	Barker									1				1		
		Beck					1		1		1						
Best Mfg.	San Leandro, Cal.	Best			1		1										
Brockway Motor Wagon Co.	Homer, N. Y.	Brockway			1		1	1*	1								
Bucklen Motor Truck Co.	Elkhart, Ind.	Bucklen				1		1			1						
Cass Motor Truck Co.	Port Huron, Mich.	Cass						1*		1							
Chase Motor Truck Co.	Syracuse, N. Y.	Chase	1		1		1	1	1								
Coleman Motor Truck Co.	Ilion, N. Y.	Coleman					1		1								
Couple Gear Freight Wheel Co.	Grand Rapids, Mich.	Couple Gear										1			1		
Crawford Automobile Co.	Hagerstown, N. Y.	Crawford				1*											
Crown Commercial Car Co.	No. Milwaukee, Wis.	Crown				1	1	1									
Chicago Pneumatic Tool Co.	Chicago, Ill.	Little Giant					1										
Cleburne Motor Car Mfg. Co.	Cleburne, Tex.	Luck Utility			1												
Clark Delivery Car Co.	Chicago, Ill.	Clark						1									
Continental Truck Mfg. Co.	Superior, Wis.	Continental					1	1									
Croxton Motor Co.	Washington, Pa.	Croxton															
Clark Co., F. G.	Lansing, Mich.	Superior					1										
Dart Mfg. Co.	Waterloo, Iowa	Dart						1									
Dayton Auto Truck Co., The	Dayton, O.	Dayton							1		1				1		
Dorris Motor Car Co.	St. Louis, Mo.	Dorris				1			1								
Driggs Seabury Ordinance Corp.	Sharon, Pa.	Vulcan									1		1	1	1	1	1
Durrant Dort Carriage Co.	Flint, Mich.	Durrant Dort					1*										
		Day Utility															
Diamond T. Motor Car Co.	Chicago, Ill.	Diamond T.						1			1				1		
Dispatch Motor Car Co.	Minneapolis, Minn.	Dispatch			2												
Elk Motor Truck Co.	Charleston, W. Va.	Elk							2		2				2		
Eclipse Motor Truck Co.	Franklin, Pa.	Eclipse					1				1						
		Erving						1									
Federal Motor Truck Co.	Detroit, Mich.	Federal					1										
Ford Motor Co.	Detroit, Mich.	Ford		1*													
Four Wheel Drive Auto Co.	Clintonville, Wis.	Four Wheel Drive						1			1						
Flanders Motor Co.	Detroit, Mich.	Hercules					1										
Grand Rapids Motor Truck Co.	Grand Rapids, Mich.	Decatur						1									
Gabriel Auto Co.	Cleveland, O.	Gabriel															
Geneva Wagon Co.	Geneva, N. Y.	Geneva			1	1*											
General Motors Truck Co.	Pontiac, Mich.	G. M. C.						2	2			2			2		
Gramm Motor Truck Co.	Lima, O.	Gramm					1		1		1				1		
Garford Co.	Elyria, O.	Garford							1		1				1		
		Gleason			1												
Gramm-Bernstein Co.	Lima, O.	B. A. Gramms							1			1					
		Great Eagle															
Grabowsky Power Wagon Co.	Detroit, Mich.	Grabowski					1	1	1		1						
Hart-Kraft Motor Co.	York, Pa.	Hart-Kraft			1	2	1	1	1	1							
Harwood-Bailey Mfg. Co.	Marion, Ind.	Indiana						1	1		1						
Haberer & Co.	Cincinnati, O.	Cino				1											
Hatfield Auto Truck Co.	Elmira, N. Y.	Hatfield			1												
Hupp Motor Co.	Detroit, Mich.	Hupmobile		1													
Ice Mfg. Co.	1170 Broadway, N. Y.	A. I. C.													1		
Ideal Auto Co.	Fort Wayne, Ind.	Ideal				1	1	1	1								
International Harvester Co.	Chicago, Ill.	I. H. C.			2												
Ideal Commercial Car Co.	Akron, O.	Akron				1											
International Motors Co.	Broadway & 57th St.	Mack					1	1	1		1		1		1		1
	New York City	Hewitt					1		1			1			1		1*
		Saurer													1		1*
Joliet Auto Tire Co.	Joliet, Ill.	Jatco				1											
Jarvis Huntington Automobile Co.	Huntington, W. Va.	Jarvis							1			1			1		
Johnson Service Co.	Milwaukee, Wis.	Johnson				1	1		1				1				
Ka Dix Newark Motor Truck Co.	Newark, N. J.	Ka Dix									2		2		2		
Kearns Motor Co.	Beavertown, Pa.	Kearns				1											
Kelly-Springfield Motor Truck	Springfield, Mass.	Kelly						1				1					
King Mfg. Co.	Kingston, N. Y.	King										1					

Directory of Motor Truck Manufacturers

COMPANY	ADDRESS	TRUCK	500	800	1000	1500	2000	3000	4000	5000	6000	7000	8000	9000	10,000	12,000	14,000
Kissel Motor Car Co	Hartford, Wis.	Kisselkar				1	1		1		1		1		1		
Kline Motor Car Corporation	Richmond, W. Va.	Kline Kar				1*											
Knickerbocker Motor Truck Mfg. Co.	New York City, N. Y.	Knickerbocker									2				2		
Knox Automobile Co	Springfield, Mass.	Knox							1		1						
Koehler, H. J., Co	Newark, N. J.	Koehler					1*										
Kopp Motor Truck Co	Buffalo, N. Y.	Kopp						1			1				1		
Krebs Commercial Car Co	Clyde, O.	Krebs															
Kelsey Mfg. Co., C. W	Hartford, Conn.	Motorette	1*–1														
		Kato															
Lange Motor Truck Co	Pittsburg, Pa.	Lange					1	1	1								
Lauth Juergens Motor Car Co	Fremont, O.	Lauth Juergens					1		1		1						
Lewis Motor Truck Co	San Francisco, Cal.	Lewis								1					2		
Lippart-Stewart Motor Car Co	Buffalo, N. Y.	Lippart-Stewart				1											
Locomobile Company of America	Bridgeport, Conn.	Locomobile													1		
Longest Bros. Co	Louisville, Ky.	Longest						1					1				
Lord Baltimore Motor Car Co	Baltimore, Md.	Lord Baltimore					1		1		1		1		1		
Lincoln Motor Car Wks	Chicago, Ill.	Lincoln		1													
		Lambert															
Mais Motor Truck Co	Indianapolis, Ind.	Mais						1	1		1						
Mason Motor Co	Waterloo, Iowa	Mason				1	1										
McIntyre Co	Auburn, Ind.	McIntyre				1		2			2						
Mercury Mfg. Co	Chicago, Ill.	Mercury			1												
Mogul Motor Truck Co	Chicago, Ill.	Mogul							1				1		1		
Monitor Motor Works	Janesville, Wis.	Monitor					2	1									
Mora Power Wagon Co	Cleveland, O.	Mora				1											
Moreland Motor Truck Co	Los Angeles, Cal.	Moreland					1		1		1						
Minneapolis Motor Co	Minneapolis, Minn.	Minneapolis															
		Tricar	1*														
Motor Car Mfg. Co	Indianapolis, Ind.	Pathfinder				1											
Nordyke & Marmon	Indianapolis, Ind.	Marmon Delivery				1											
National Motor Truck Co	Bay City, Mich.	Natco					1										
Nelson & LeMoon	Chicago, Ill.	LeMoon						1		1		1					
Nyberg Automobile Works	Anderson, Ind.	Nyberg						1									
Old Reliable Motor Truck Co	Chicago, Ill.	Old Reliable									1				1		
Oliver Motor Truck Co	Detroit, Mich.	Oliver				1		1									
Packard Motor Car Co	Detroit, Mich.	Packard							2		1				1		
Packers Motor Truck Co	Wheeling, W. Va.	Packers							1				1				
Palmer Mayer Motor Car Co	St. Louis, Mo.	Palmer				1											
Peerless Motor Car Co	Cleveland, O.	Peerless									1		1		1	1	
Pierce-Arrow Motor Car Co	Buffalo, N. Y.	Pierce-Arrow													1		
Piggins Motor Truck Co	Racine, Wis.	Practical Piggins					1										
Plymouth Motor Truck Co	Plymouth, O.	Plymouth					1		1								
Pope Mfg. Co	Hartford, Conn.	Pope Hartford									1				1		
Poyer & Co., D. F	Menominee, Mich.	Menominee				1	1										
Pratt, Carter, Sigsbee & Co	Detroit, Mich.	Wolverine-Detroit			1												
Randolph Motor Car Co	Flint, Mich.	Randolph					1		1				1		1	1	
Reo Motor Truck Co	Lansing, Mich.	Reo				1			1								
Robinson Motor Truck Co	Minneapolis, Minn.	Minneapolis						1	1								
Rowe Motor Mfg. Co	Coatesville, Pa.	Rowe				1	1	1	1		1				1		
Sayers & Scovill Co	Cincinnati, O.	S & S				1											
Sampson Mfg. Co., Alden	Detroit, Mich.	Sampson						1			1				1		
Sandusky Auto Parts & Motor Truck Co.	Sandusky, O.	Sandusky				1		1									
Sanford Motor Truck Co	Syracuse, N. Y.	Sanford					2										
Schleicher Motor Vehicle Co	Ossining, N. Y.	Schleicher									1				1		
Seagrave Co	Columbus, O.	Seagrave							1		1						
Schmidt Bros. Co	Chicago, Ill.	Schmidt				1	1										
Selden Motor Vehicle Co	Rochester, N. Y.	Selden															
Service Motor Car Co	Wabash, Ind.	Service				1	1	1									
Smith Company, A. O	Milwaukee, Wis.	Smith-Milwaukee										1				1	
Speedwell Motor Car Co	Dayton, O.	Speedwell							1				1			1	
Standard Motor Truck Co	Detroit, Mich.	Standard									4						
Stearns Co., The F. B	Cleveland, O.	Stearns													2		
Schacht Motor Car Co	Cincinnati, O.	Schacht				1	1		1		1		1				
Stegeman Motor Car Co	Milwaukee, Wis.	Stegeman				1	1		1		1		1			1	
Sternberg Mfg. Co	Milwaukee, Wis.	Sternberg							3		2		1			1	
Seitz Automobile & Transmission Co.	Wyandotte, Mich.	Seitz				1	1		1		1				1		
		Schacher			1		1		1		1		1				
Stewart Motor Corporation	Buffalo, N. Y.	Stewart				1											
Stewart Iron Works Co	Cincinnati, O.	Stewart					1										
Studebaker Automobile Co	South Bend, Ind.	Studebaker						1*					1				
Sullivan Motor Car Co	Rochester, N. Y.	Sullivan			1	1											
Staver Carriage Co	Chicago, Ill.	Staver				1											
Schlotterback Mfg. Co	Newark, N. J.	Koehler					1*										
Toledo Motor Truck Co	Toledo, O.	Toledo					2		1								
Transit Motor Truck Co	Louisville, Ky.	Transit							1			1			1		
Triumph Motor Car Co	Chicago, Ill.	Triumph						1									
Tulsa Automobile & Mfg. Co	Tulsa, Okla.	Tulsa				1	1	2									
Universal Motor Truck Co	Detroit, Mich.	Universal					1		1		1					1	
United States Motor Truck Co	Cincinnati, O.	U. S.							1		1						
Union Motor Truck Co	San Francisco, Cal.	Union							1								
Universal Machinery Co	Milwaukee, Wis.	Progress						1									
Veerac Motor Co	Anoka, Minn.	Veerac					1										
Velie Motor Vehicle Co	Moline, Ill.	Velie							1		1						
Walter Auto Truck Co	New York City, N. Y.	Walters							1		1	1			1		
Ware Motor Vehicle Co	St. Paul, Minn.	Ware															
Warren Motor Car Co	Detroit, Mich.	Warren							1						1		
White Co	Cleveland, O.	White				1		1			1				2		
Wichita Falls Motor Co	Wichita Falls, Tex.	Wichita					1		1								
Wilcox Motor Car Co., H. E	Minneapolis, Minn.	Wilcox					1	1			1						
Willet Engine & Carbureter Co	Buffalo, N. Y.	Willet							1								
Willys-Overland Co	Toledo, O.	Overland		1													
Wyckoff Church & Partridge	Kingston, N. Y.	Commer													1		1
Wagenhalls Commercial Motor Car Co	St. Louis, Mo.	Wagenhalls	1	1													
Zimmerman Mfg. Co	Auburn, Ind.	Zimmerman		1													

Contrast The Motor and



Oval—The motor trucks sailed majestically along the snow-swept streets
Right—Extra horses were necessary to pull heavy loads after the storm
Upper Left—The wagon crew often had to put their shoulders to the wheel
Bottom—Deep in the drifts, the driver had to help the horse turn

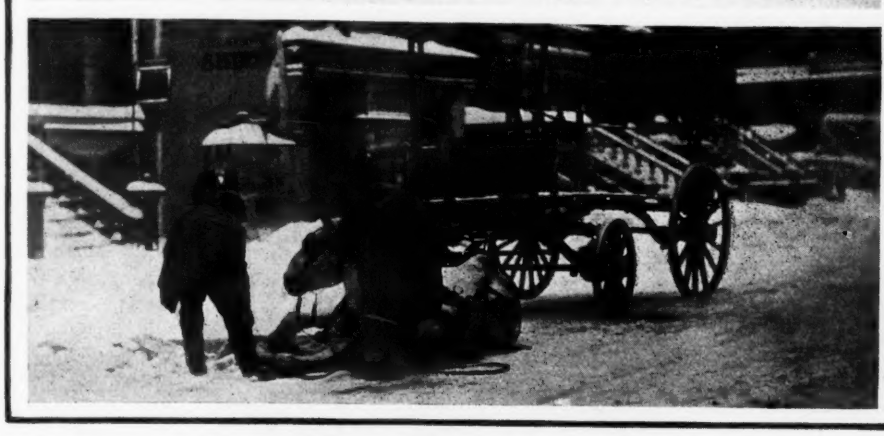
Delivery in the

WHEN the avalanche of snow descended upon New York City Christmas Eve, it found the holiday delivery business just passing the peak of the load. When the storm was at its height, the volume of deliveries was on a lessening scale and the crux of the storm was too late to do any serious harm to the delivery systems at large. Nevertheless, the managers of most of the delivery departments of the big department stores declared that the motor trucks in their service were of primary importance in clearing up the holiday rush. On the slippery pavements the horses were unable to keep their feet and strained in vain to draw the heavy loads, while the trucks majestically sailed on their way, unhampered by the drifting snow and the treacherous traction.

But, from the beginning of the snowfall until the last of the Christmas Eve deliveries was made, something over 1,000,000 packages were carried from retail stores to consumers within the delivery districts. It is estimated by the delivery chiefs of the department stores that the packages averaged 5.5 pounds, and thus the total amount of Christmas busi-

Pictures the Horse —

Christmas Storm



ness done by the delivery systems during the storm was 5,500,000 pounds or 2,750 tons.

Throughout the storm these motor vehicles did yeoman service. Some of them were used continuously for full 24 hours, though the average service of the whole battery of trucks in use has been estimated at 18 hours.

Only one complaint was made on account of the truck service. Traction in the falling snow was uncertain and the demand for chains exhausted the supply in 2 hours. This led to some astonishing makeshifts to prevent skidding and to obtain traction. Bits of carpets were bound upon tire treads; impromptu chains were hastily forged at blacksmith shops; ropes were pressed into service pretty generally and the business was moved.

The use of non-skid devices on trucks is a subject that has caused a large amount of debate in the automobile industry. Advocates of chains state that they are necessary in light snow and others hold that a very large truck under load does not require chains under any conditions.

They also declare that a good driver does not need chains to the

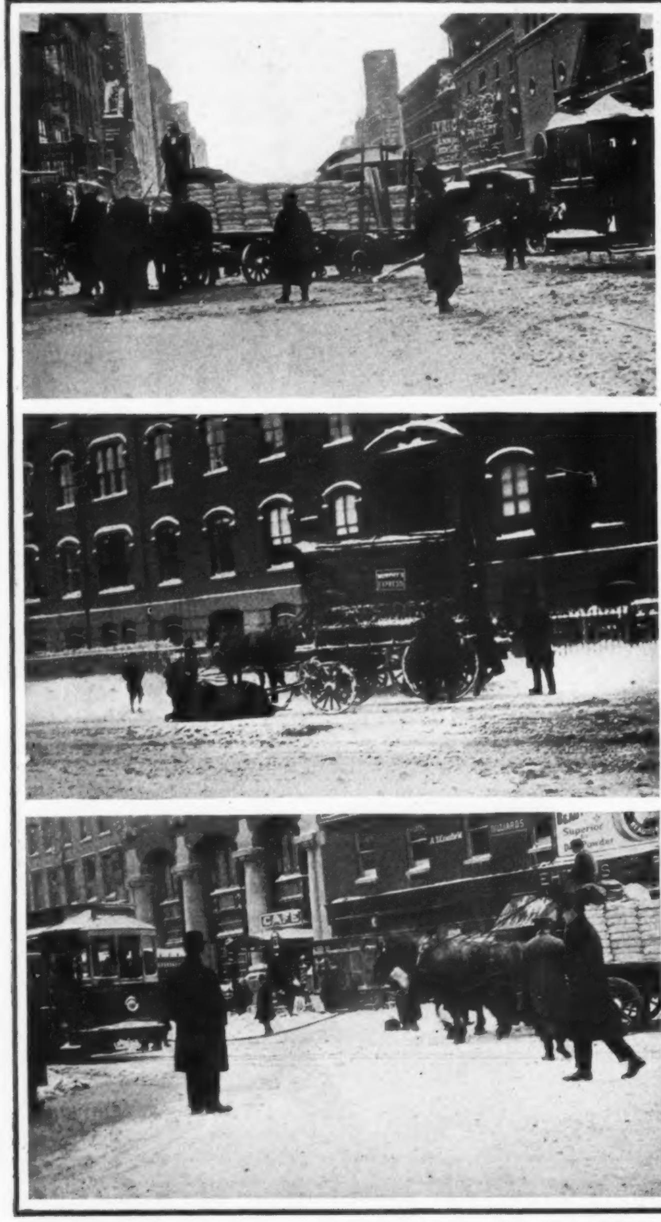
Oval—The way the motor trucks bowled merrily along in spite of ice and snow

Left—It took as many men as horses to deliver a load of coal in the storm

Upper Right—Every few moments traffic would be blocked by a fallen horse

Bottom—Even when the wagon was empty the horse could not keep his feet

Fixing up a strained trace at Columbus Circle



The panel of three pictures shown above gives an idea of the difficulties which the drivers of horse-drawn wagons had to conquer in order to make deliveries

same extent that the novice or careless driver requires them. Nevertheless, the rush for chains was a concerted movement when the snow began to fall. Not only that, but the reports of stalled automobile trucks fails to include any mention of one which was equipped with chains that fitted the tires.

With the horses there was a very different story to tell. During the hours when the snow was unpacked, those that were smooth-shod floundered and fell in all parts of the city, as shown in the accompanying illustrations, and where the streets are paved with granite or other unyielding surface matèrial, it did not matter whether they were rough-shod or not. After the snow packed, the horses which had calks in their shoes did better but the service was considerably delayed in spots.

Systems of transportation in New York are divided into three classes on an equipment basis. First, the fully motorized systems; second, the mixed systems and third, the exclusive horse systems.

There was no trouble to speak of with the first named class; a small amount of difficulty, mostly due to temporary delays in the second and a considerable amount with the last.

From noon of December 24 guaranteed delivery was not universal among the New York stores as it usually is on that day. No formal notification was published for the guidance of salesmen not to promise deliveries within the day, but the word was passed around in some of the stores that rash promises of delivery should be avoided and that the word confident should be substituted for the word guaranteed in all delivery promises.

Fortunately weather conditions so shaped themselves that the deliveries were actually made, although in some outlying districts Santa Claus arrived after midnight.

Some of the leading houses had the following to say about the Christmas deliveries in relation to the storm conditions:

Greenhut-Siegel Cooper Company: Deliveries slowed up after the storm was over, but not sufficiently to cause disappointment to our patrons in the matter of Christmas deliveries. We retain the horse as motive power for our deliveries in large proportion, although the department includes a large number of automobiles. We were obliged to double our horse equipment during the snow, but fortunately we were in position to do so with little disturbance of the system. Everybody met with some delays during the day and night.

Macy's: The delivery chief said: We use 450 horses and 55 automobiles of various types. The horses are used for central work and to distribute from our suburban depots

The big motor busses covered their route with no trouble

and the automobiles for the heavy long-haul work. We had no trouble as the storm broke too late to catch us at the height of the holiday deliveries.

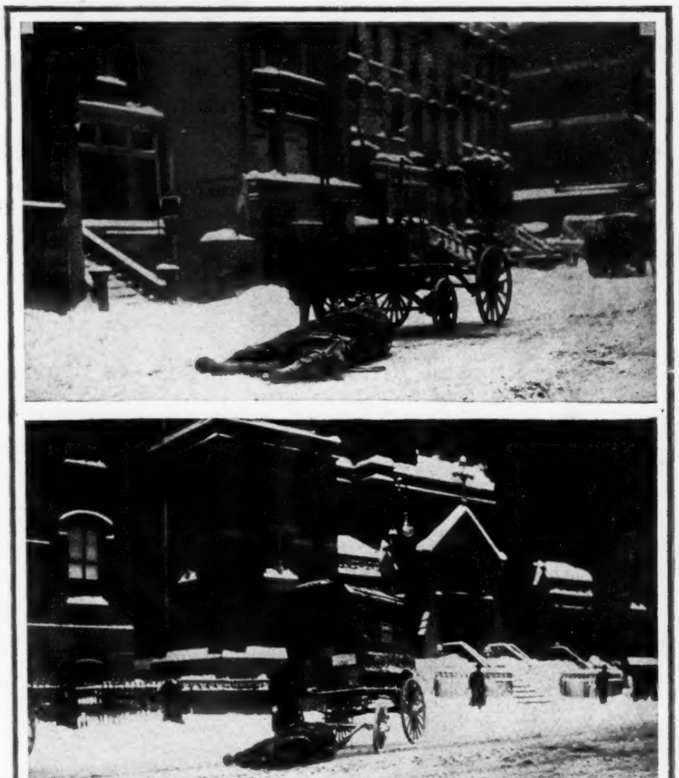
Gimbel's: Captain Mabie, chief of transportation, said: Gimbel's is completely motorized and our equipment proved adequate although it was worked to its full capacity. We had some trouble, but nothing out of the ordinary. Working out from the store, warehouses and depots under full load the drivers reported no delays, but in certain cases where chains were lacking the empty cars had some trouble in returning on schedule. Compared with other storms where mixed equipment was used, the showing Christmas Eve was excellent.

W. & J. Sloane: Our battery of eighteen Whites and five General Vehicles performed splendidly under the heavy business and weather conditions of Christmas Eve. It would be foolish to say that the business was handled under the storm conditions as any ordinary day's business could be handled, but our patrons have made no complaint, which is the real measure of the situation.

Wanamaker's: If the storm had come along 24 hours before it did, deliveries generally would have been delayed to a greater extent, but it was withheld long enough to remove its sting. Under ideal weather conditions, Christmas business must be slower in delivery than ordinary business, because of its volume. When a storm intervenes there must be some delay. Luckily we had no more than our share, which was little.

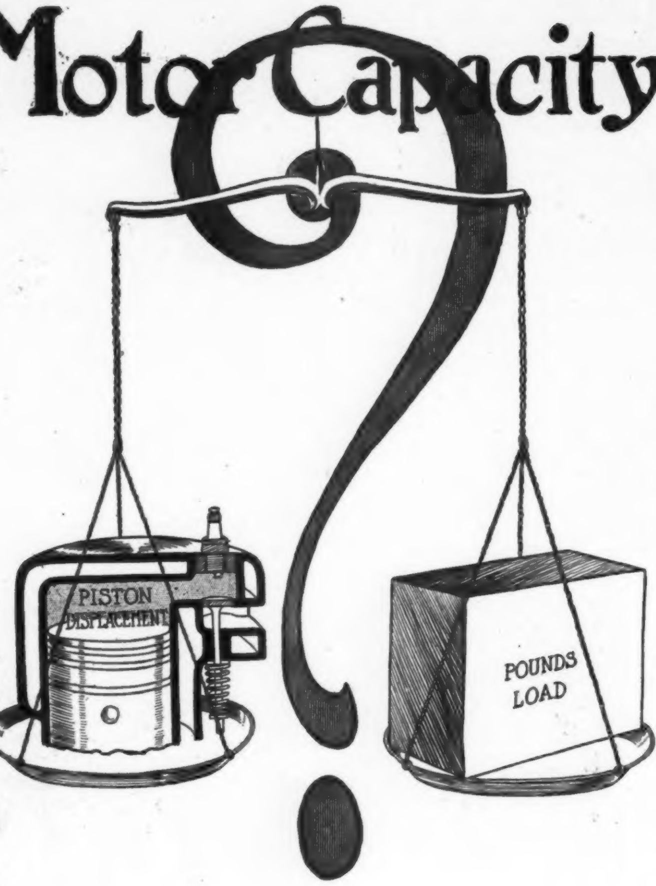
Burns Brothers: During the height of the storm an order was received for the immediate delivery of 54 tons of coal from one of our North River pockets to a customer on the east side of town. Three of our 10-ton Hewitts were available for the job and three three-horse teams hauling 8-ton wagons were standing in the shed. The six vehicles were loaded and each automobile was assigned to a wagon as a helper. The six started out, but before they had gone far the drivers of the horses signalled for help and the fleet went through Forty-second street with the automobiles towing the horse trucks. During the run the horses had all they could do to keep their footing, but the heavily loaded automobiles did not require chains.

John E. Morrell & Co.: We used electric trucks in our delivery service on Christmas Eve, and while we experienced some delays as the traction was very bad, the power wagons handled the business. Compared with former years and storms where we used horses, the showing during the holidays was excellent.



When the horses fell, exhausted by their struggle on the precarious foothold afforded by the icy pavements, it was often a hard task to get them to their feet

Motor Capacity—Load Ratios



Describing by Charts and Tables How Different Makers of Trucks Have Met the Situation, Showing Considerable Diversity of Opinion

OWING to the varying conditions under which trucks operate, there is bound to be a wide difference of opinion as to the proper relation of horsepower to useful load. The rated horsepower is no criterion to form a basis of calculation, as the accepted formula in use at present does not take the stroke or revolutions per minute directly into consideration. This being the case, the next best method is to take some common unit as piston displacement in cubic inches and compare it to the useful load capacity of the vehicle. In fairness to the makers it may be well to state at the outset that motors are not fitted to trucks without any regard to general economy. Economy and efficiency are the two desiderata of the truck user. The question of the size of the engine as compared with the useful load has been a much-debated one for some time past and the following tables and charts have been prepared, from data furnished by individual makers, for the readers of THE AUTOMOBILE, to show the present trend of affairs rather than to show directly or by inference what the best ratio should be. It would be necessary to know many things in order to attempt to criticize, and even then, any conjecture might fall short of the actual conditions.

While the truck business generally has grown by leaps and bounds in the last few years, there have not been enough data for engineers to go upon to determine what the best ratio should be. On the one hand there is the maker who fits a large engine and claims greater all-round efficiency despite increased running costs due to a larger consumption of oil and gasoline, but the mere fact that the engine is large is not a proof that the consumption will be high. The maker who fits a comparatively small engine with a high ratio of useful load to piston displacement probably has a better showing upon consumption than his larger competitor. But how high should this ratio be so as to insure the motor from being overloaded or, in other words, breaking its back endeavoring to carry the load?

In this connection conditions of service are the main factors to determine the question. It would be safe to assume that it would take less power to drive a pneumatic-tired truck than one

Load Capacity and Piston Displacement of Trucks Under 2000 Pounds

NAME	Load Capacity in Pounds	Society Automobile Engineers Horsepower	Number of Cylinders	Bore and Stroke	Piston Displacement in Cubic Inches	Ratio of Load in Pounds per Cubic Inch of Piston Displacement
Available	1500	22.10	2	5¼x4	173.1	8.6:1
Akron	1500	22.5	4	3¾x5	220.9	6.8:1
Armleder	1500	16.92	4	3¼x4	132.7	11.2:1
Atterbury	1500	22.5	4	3¾x4½	198.8	7:1
Anglaize	1200	22.10	2	5¼x4	173.1	6.9:1
Bergdoll	1500	25.6	4	4 x4½	226.2	6.7:1
Brown	1500	22.5	4	3¾x5¼	231.9	6.4:1
Bessemer	1000	19.61	4	3½x4½	173.2	5.8:1
Babcock	1500	22.10	2	5¼x4	173.1	8.6:1
Brooks	1800	11.25	2	3¾x3¾	82.8	9.3:1
Buick	1000	9.82	2	3½x5	96.2	10.4:1
Crawford	1200	29.0	4	4¼x4½	255.3	4.9:1
Durant Dort	1600	22.5	4	3¾x4½	198.8	8:1
Dorris	1500	30.65	4	4⅜x5	300.7	5:1
Geneva	1000	21.00	2	5⅛x4½	185.6	5.4:1
I. H. C. Commercial	1000	16.20	2	4½x5	157.2	6.3:1
Jatco	1500	22.10	2	5¼x4	173.1	8.6:1
KisselKar	1500	29.	4	4⅛x4¼	211.1	6.2:1
Koehler	1600	22.10	2	5¼x4	173.1	9.2:1
Koehler	750	22.10	2	5¼x4	173.1	4.3:1
Lippard Stewart	1500	22.5	4	3¾x5¼	231.9	6.4:1
Mason	1500	20.	2	5 x5	196.3	8.5:1
Modern	1000	22.5	4	3¾x4½	198.8	5:1
Modern	1500	22.5	4	3¾x5¼	231.9	6.4:1
Oliver	1500	40.	4	5 x5	392.7	3.8:1
Overland	800	25.60	4	4 x4½	226.2	3.5:1
Palmer	1500	22.5	4	3¾x5	220.9	6.8:1
Reo	1500	9.05	1	4¾x6	106.3	14.1:1
Schmidt	1500	20.	2	5 x4¾	186.5	8:1
Stewart	1500	22.50	4	3¾x5¼	231.9	6.4:1
Service	1500	22.5	4	3¾x5½	242.9	6:1
Stegeman	1500	22.5	4	3¾x5¼	231.9	6.4:1
Sandusky	1500	22.5	4	3¾x5	220.9	6.8:1
S & S	1500	27.20	4	4⅛x5¼	280.6	5.4:1
Sullivan	1000	32.4	4	4½x4½	286.3	3.5:1
Sullivan	1500	32.4	4	4½x4½	286.3	5.2:1
Schacht	1500	29.0	4	4¼x5½	312.	4.8:1
Tulsa	1500	22.5	4	3¾x4½	198.8	7:1
Wolverine	1000	8.10	1	4½x5½	88.5	11.3:1
White	1500	22.5	4	3¾x5⅛	226.4	6.7:1

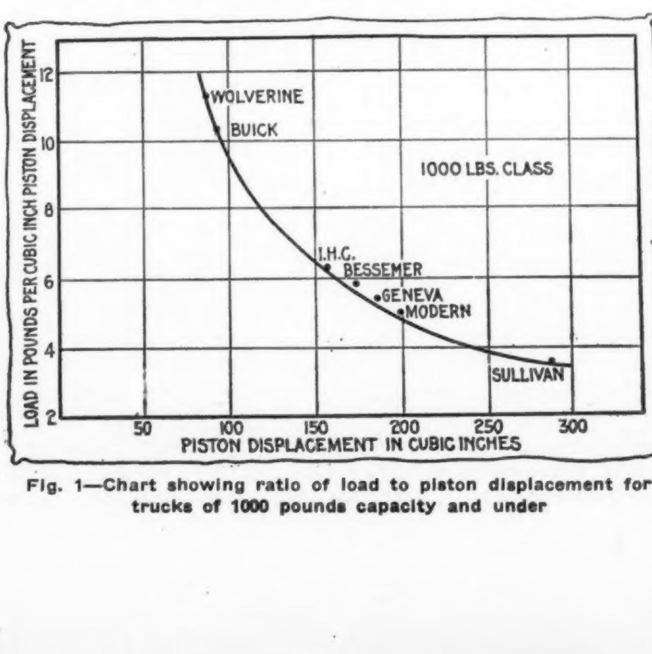


Fig. 1—Chart showing ratio of load to piston displacement for trucks of 1000 pounds capacity and under

fitted with solid tires; also that a truck running on level roads would perform better with a comparatively small engine than with one of more power that it was necessary to keep throttled down the best part of the time. Truck users have themselves to blame in some cases for apparent lack of efficiency. There has been a desire on the part of some to make a 2-ton truck do the work of a 3 or even a 4-tonner, and with the overload expect the same maximum speed that was intended for the rated capacity. Truck makers are entirely at the mercy of their customers in this respect and with a better understanding of the overload and overspeeding situation there is a possibility of a reduction of the power at present existing to a conservative average that will bring with it a more economical vehicle.

Under 2,000-Pound Class

¶ The chart for this class, Fig. 1, shows the ratio of useful load in pounds per cubic inch of piston displacement of seven vehicles. The first two vehicles have one and two-cylinder engines respectively, which fact naturally gives them a small piston displacement. The largest truck, the Sullivan, has a small ratio in the 1,000-pound class, but by referring to the table for vehicles under 1 ton it will be found that the same size engine is used in the 1,500-pound chassis as well. Its relative position is also shown on the 1,500-pound chart, Fig. 2. This chart has been plotted from the figures of twenty-five vehicles and while the ratio stretches from the 14-pound to the 5-pound line nevertheless the greater proportion lies in between the 6 to 8-pound lines. In other words, the general average ratio is 6 to 8 pounds useful load per cubic inch piston displacement. All vehicles above the 8-pound line, with the exception of the Available, which has a four-cylinder motor, are fitted with one or two-cylinder engines. No doubt the motor capacity of this class has in a measure been influenced by pleasure car practice, the available data being sufficient to form a foundation to work upon.

2,000-Pound Class

¶ The average horsepower for this class is approximately 25, according to S. A. E. rating, and the average ratio is 8.47 pounds load per cubic inch of piston displacement. The elongation of the curve for this category, Fig. 3, is caused by the fact that several makers who cater to this class fit the same engine in the next heavier class that they do in this case. When the reason for this is inquired into it will be apparent to any one that the 1-ton truck is expected to go faster than the 2-ton, consequently the gear ratio will be higher and therefore requiring more power to drive it. The concentration of effort upon one motor also is cheaper for the maker and in the case where a truck user has several vehicles of one make, for example, some of the 1-ton and some of the 2-ton types, parts for one will fit the other, which is quite an item when the repair question is taken into consideration.

The general average ratio above stated can be realized by referring to the chart, Fig. 3, which shows that a number of makers use the same size engine, with a piston displacement of 231.9 cubic inches, while several more use an engine with 226.2 cubic inches piston displacement. The two largest, namely, the Mack and the KisselKar, have the same rated horsepower, the bore in each case being the same, but the stroke of the Mack is .5-inch longer, giving the motor 16 cubic inches more displacement, and .3 pound load less per cubic inch displacement.

3,000 to 4,000-Pound Class

¶ These classes are so inter-connected that it may be well to deal with the two capacities as a whole from the point of view of averages. Reference to the table will show that several makers fit the same size of engine to the 3,000-pound chassis that others use in the 4,000-pound. In order to differentiate between the classes two separate curves have been plotted.

Taking the two classes as a whole, there are fifty-three makes represented, which is by far the greatest number for any class.

Load Capacity and Piston Displacement of Trucks of 2000 Pounds

NAME	Load Capacity in Pounds	Society Automobile Engineers Horsepower	Number of Cylinders	Bore and Stroke	Piston Displacement in Cubic Inches	Ratio of Load in Pounds Per Cubic Inch of Piston Displacement
Available	2000	22.5	4	3¾x4½	198.8	10:1
Adams	2000	24.22	4	3⅞x5	235.8	8.5:1
Armleder	2000	25.60	4	4 x4½	226.2	8.8:1
Atterbury	2000	25.60	4	4 x4½	226.2	8.8:1
Anglaise	2000	22.5	4	3¾x5¼	231.9	8.6:1
Bessemer	2000	22.5	4	3¾x5¼	231.9	8.6:1
Cass	2500	25.6	4	4 x4½	226.2	11:1
Crown	2000	25.6	4	4 x4½	226.2	8.8:1
Federal	2000	29.0	4	4¼x4½	255.3	7.8:1
Gramm	2000	29.0	4	4¼x4½	255.3	7.8:1
Hercules	2000	22.5	4	3¾x5¼	231.9	8.6:1
Ideal	2000	22.5	4	3¾x5¼	231.9	8.6:1
KisselKar	2000	32.40	4	4½x5¼	334.	6:1
Kelly	2000	22.5	4	3¾x5¼	231.9	8.6:1
Lord Baltimore	2000	22.5	4	3¾x5	220.9	9:1
Lange	2000	22.5	4	3¾x5¼	231.7	8.6:1
Mack	2000	32.40	4	4½x5½	349.9	5.7:1
Mason	2000	20	2	5 x5	196.3	10.2:1
Natco	2000	19.61	4	3½x5	192.4	10.4:1
Practical Piggins	2000	29.00	4	4¼x4¾	269.4	7.4:1
Superior	2000	22.5	4	3¾x5¼	231.9	8.6:1
Sanford	2000	25.60	4	4 x4½	226.2	8.8:1
Selden	2000	22.5	4	3¾x5¼	231.9	8.6:1
Stegeman	2000	22.5	4	3¾x5¼	231.0	8.6:1
Schacht	2000	29.0	4	4¼x5½	312.0	6.4:1
Toledo	2000	27.2	4	4⅛x5¼	280.6	7.1:1
Tulsa	2000	27.2	4	4⅛x5¼	280.6	7.1:1
Universal	2000	22.5	4	3¾x5¼	231.9	8.6:1
Ware	2000	29.0	4	4¼x5½	312.	6.4:1
Wichita	2000	16.92	4	3¼x5	165.9	12.1:1

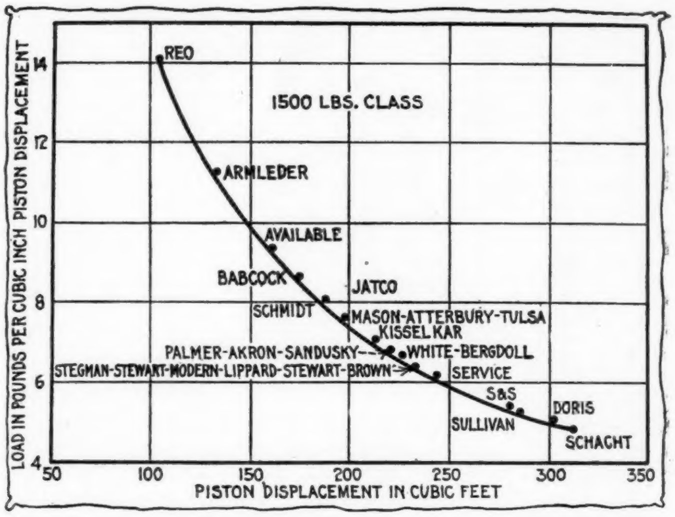


Fig. 2—Chart of the 1500-pound class, showing a decided tendency in load displacement between 6 and 8 pounds per cubic inch

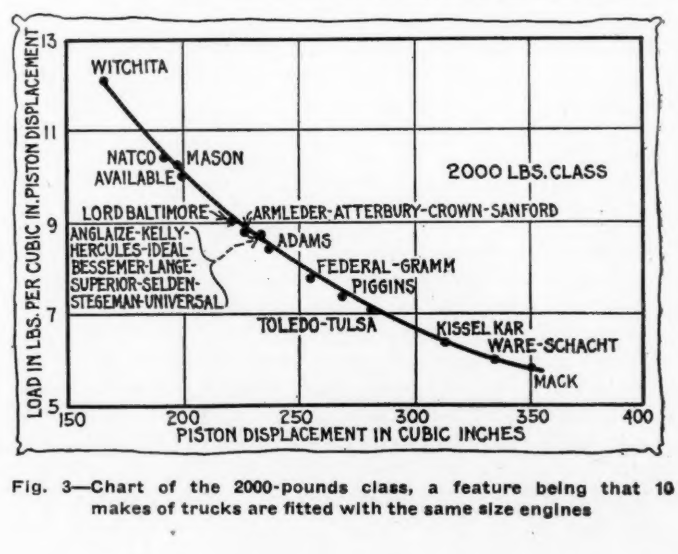


Fig. 3—Chart of the 2000-pounds class, a feature being that 10 makes of trucks are fitted with the same size engines

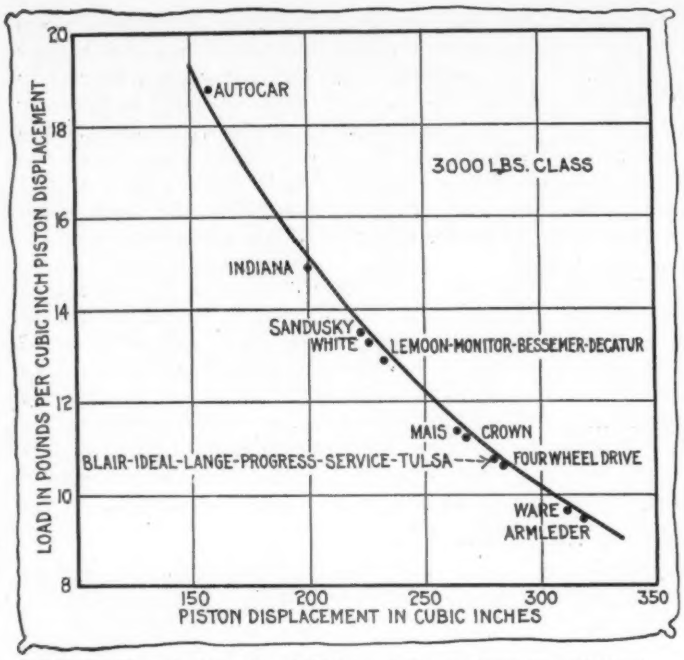


Fig. 4—The chart of the 3000-pound class shows two distinct tendencies

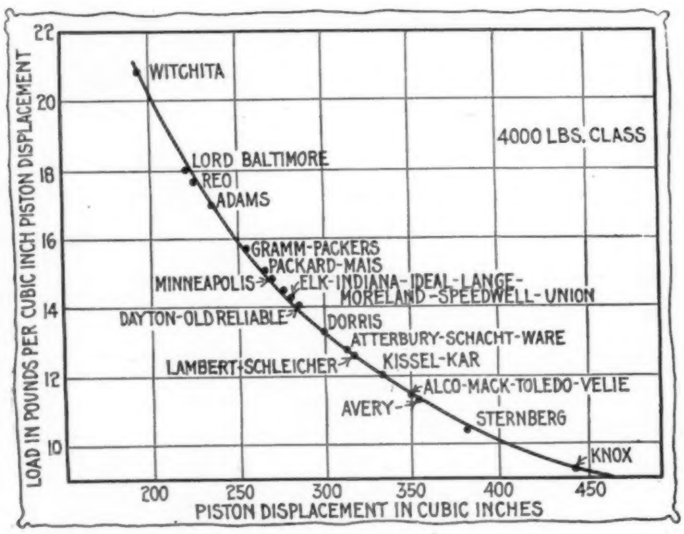


Fig. 5—The chart shows that the 4000-pound class is well represented

Of this there are thirty-four 2-ton models. The average horsepower is 28.8 and the average ratio of useful load in pounds per cubic inch of piston displacement is 13.16.

The Knox is fitted with the largest engine, having a piston displacement of 431.9 cubic inches, the ratio of which is 9.3 pounds useful load per cubic inch. This same size of engine is used in the Knox 3-ton chassis.

The average bores of the engines of this class range from 4 to 4.5 inches, the strokes varying from 5 to 5.5 inches.

5,000 to 6,000-Pound Class

¶ This class is represented in the tabulation by thirty-three models, four of which are 5,000-pound capacity and the rest 6,000-pound trucks. The horsepowers and load displacement ratios differ considerably, as can be seen by the length of the curve in Fig. 6, so the average horsepower is the best criterion for the class, this being 32.69, and the average ratio 17.76 pounds useful load per cubic inch of piston displacement. The chart, Fig. 6, shows that the piston displacement of the majority of the trucks is between 350 and 400 cubic inches and the ratio

Load Capacity and Piston Displacement of Trucks of 3000 and 4000 Pounds

NAME	Load Capacity in Pounds	Society Automobile Engineers, Horsepower	Number of Cylinders	Bore and Stroke	Piston Displacement in Cubic Inches	Ratio of Load in Pounds per Cubic Inch of Piston Displacement
Avery	4000	36.15	4	4¾x5	354.4	11.3:1
Adams	4000	24.22	4	3⅞x5	235.8	17:1
Armleder	3000	32.4	4	4½x5	318.1	9.4:1
Atterbury	4000	29.0	4	4¼x5½	312.	12.8:1
Alco	4000	32.4	4	4½x5½	349.9	11.4:1
Autocar	3000	18.10	2	4¾x4½	159.5	18.7:1
Bessemer	3000	22.5	4	3¾x5¼	231.0	12.9:1
Blair	3000	27.20	4	4⅛x5¼	280.6	10.7:1
Crown	3000	27.20	4	4⅛x5	267.3	11.2:1
Decatur	3000	22.5	4	3¾x5¼	231.9	12.9:1
Dorris	4000	30.65	4	4⅜x5	300.7	13.3:1
Durable Dayton	4000	29.0	4	4¼x5	283.6	14.1:1
Elk	4000	27.20	4	4⅛x5¼	280.6	14.3:1
Four-Wheel Drive	3000	29.0	4	4¼x5	283.6	10.6:1
Gramm	4000	29.	4	4¼x4½	255.3	15.7:1
Indiana	3000	25.60	4	4 x4	201.1	14.9:1
Indiana	4000	27.20	4	4⅛x5¼	280.6	14.3:1
Ideal	3000	27.2	4	4⅛x5¼	280.6	10.7:1
Ideal	4000	27.2	4	4⅛x5¼	280.6	14.3:1
KisselKar	4000	32.40	4	4½x5¼	334.	12:1
Knox	4000	40.	4	5 x5½	431.9	9.2:1
Lambert	4000	32.4	4	4½x5	318.1	12.6:1
Lord Baltimore	4000	36.15	4	3¾x5	220.9	18:1
Lange	3000	27.2	4	4⅛x5¼	280.6	10.7:1
Lange	4000	27.2	4	4⅛x5¼	280.6	14.3:1
LeMoon	3000	22.5	4	3¾x5¼	231.9	12.9:1
Moreland	4000	27.2	4	4⅛x5¼	280.6	14.3:1
Mack	4000	32.40	4	4½x5½	349.9	11.4:1
Mais	3000	25.60	4	4 x5¼	263.9	11.3:1
Mais	4000	25.60	4	4 x5¼	263.9	15.1:1
Minneapolis	4000	29.0	4	4¼x4¾	269.4	14.8:1
Monitor	3000	22.5	4	3¾x5¼	231.9	12.9:1
Old Reliable	4000	29.00	4	4¼x5	283.6	14.1:1
Packers	4000	29.00	4	4¼x4½	255.3	15.7:1
Packard	4000	26.4	4	4 1/16x5⅛	265.7	15.1:1
Plymouth	4000	36.15	4	4¾x5	354.4	11.3:1
Progress	3000	27.20	4	4⅛x5¼	280.6	10.7:1
Reo	4000	25.6	4	4 x4½	226.2	17.7:1
Speedwell	4000	27.20	4	4⅛x5¼	280.6	14.3:1
Sternberg	4000	29.0	4	4¼x6¾	383.0	10.4:1
Service	3000	27.20	4	4⅛x5¼	280.6	10.7:1
Sandusky	3000	22.5	4	3¾x5	220.9	13.5:1
Schleicher	4000	32.4	4	4½x5	318.1	12.6:1
Schacht	4000	29.0	4	4¼x5½	312.1	12.8:1
Toledo	4000	32.40	4	4½x5½	349.9	11.4:1
Tulsa	3000	29.20	4	4⅛x5¼	280.6	10.7:1
Union	4000	27.2	4	4⅛x5¼	280.6	14.3:1
Universal	4000	25.6	4	4 x5½	276.5	14.5:1
Velie	4000	32.4	4	4½x5½	349.9	11.4:1
Ware	3000	29	4	4¼x5½	312.	9.6:1
Ware	4000	29	4	4¼x5½	312.	12.8:1
Wichita	4000	19.61	4	3½x5	192.4	20.8:1
White	3000	22.5	4	3¾x5⅛	226.4	13.3:1

of load lies between 14.5 and 17 pounds useful load per cubic inch piston displacement.

The largest engine in this class, the Mack, is another example of the same size engine used in several classes. The 3-ton chassis does not have to be built extremely heavy and, while so many makers have not catered to it as the 1.5 to 2-ton type, or even the 2-ton type alone, nevertheless the size is one that is popular, it being the happy medium between the light and the heavy class. It is adapted to the long-distance haul, wherein lightness is an advantage and the motor has a better opportunity of turning over at a more even speed than in city work where traffic stops necessitate considerable fluctuations in the revolutions per minute and constant speed changing. The average horsepower for this class is 32.5, there being ten makers out of the thirty-three herewith scheduled who fit larger engines than the average.

7,000 to 8,000-Pound Class

¶ This class has not attracted as many makers as the one below it, namely, the 6,000-pound nor as many as the next larger, the 5-ton class. Eighteen models are represented in the tabulation, eleven belong to the 8,000-pound and seven to the 7,000-pound classes. With few exceptions the piston displacement of this class lies between 320 and 420 cubic inches. In order to strike a general average the class has been taken as a whole, the average horsepower being 34.4 and the average ratio of useful load is 20.55 pounds per cubic inch of piston displacement. The

chart, Fig. 7, shows two curves, one for the 7,000-pound and one for the 8,000-pound chassis. In the 7,000-pound class the Alco has the largest piston displacement with a ratio of 14.3 pounds useful load per cubic inch displacement and the smallest, the De Dion Bouton, with a ratio of 23.3 pounds per cubic inch. One point that has not been mentioned so far is the question of engine speed and gear ratio. Quite aside from the question of piston displacement these two features have a direct bearing one upon the other, as well as upon the cylinder contents.

8,000 to 10,000 Class

¶ From the 8,000-pound chassis upwards the power of the motor is influenced, not only by the load to be carried, but also by the total weight of the chassis as well, the work to be performed and the nature of the country in which the vehicle is to operate. There would not be any advantage in fitting a motor larger than the average for this class, namely, 35, if the truck were intended for level roads, but this rated power might prove entirely inadequate, as it has in some cases, in very hilly districts. A more powerful motor would not only be advisable under certain circumstances, but sometimes imperative.

10,000 Pound Class

¶ This class covers twenty-three makes of trucks in the tabulation, all rated at 10,000-pound carrying capacity. The 5-ton truck has attracted many of the most prominent concerns in this country, and while it may be said that the greater number favor a motor with a piston displacement of between 400 and 500 cubic inches, yet there are ten makers who fit smaller motors and four who fit larger ones than this average. The average rated horsepower is 37.44, but this is below the horsepower actually developed. For an example of this one only has to look at the upper end of the curve and compare the four smallest engines. The White and the De Dion are rated the same but there is a difference of 14 cubic inches in displacement, as the De Dion has a longer stroke. The piston velocity in feet per minute might show an entirely different aspect as also would the gear ratios. The Vulcan is rated at 30.65 horsepower, while the Knicker-

Load Capacity and Piston Displacement of Trucks of 5000 and 6000 Pounds

NAME	Load Capacity in Pounds	Society Automobile Engineers Horsepower	Number of Cylinders	Bore and Stroke	Piston Displacement in Cubic Inches	Ratio of Load in Pounds per Cubic Inch of Piston Displacement
A & R	6000	40.0	4	5 x5¾	451.6	13.3:1
Avery	6000	36.15	4	4¾x5	354.4	17:1
Atterbury	6000	38.25	4	4⅞x5½	410.6	14.8:1
Blair	5000	32.4	4	4½x5½	349.9	14.3:1
Croxton	6000	27.20	4	4⅛x5½	294.	20.4:1
De Dion Bouton	5000	14.40	4	3 x4¾	134.3	36.5:1
Durable Dayton	6000	36.15	4	4¾x5½	389.9	15.3:1
Four-Wheel Drive	6000	36.15	4	4¾x5½	389.9	15.3:1
Gramm	6000	40.	4	5 x5	392.7	15.3:1
Indiana	6000	36.15	4	4¾x5	354.4	17:1
KisselKar	6000	38.25	4	4⅞x5	373.3	16.1:1
Knickerbocker	6000	32.40	4	4½x5	318.1	19:1
Knox	6000	40.00	4	5 x5½	431.9	13.9:1
Kadix	6000	32.40	4	4½x5½	349.9	17.1:1
Lewis	5000	29.00	4	4¼x5	283.6	17.6:1
Lord Baltimore	6000	36.15	4	4¾x5½	389.9	15.3:1
LeMoon	5000	27.20	4	4⅛x5¼	280.6	17.8:1
LeMoon	6000	32.40	4	4½x5½	349.9	17.1:1
Mais	6000	25.60	4	4 x5¼	263.9	22.3:1
Mack	6000	48.48	4	5½x6	570.2	10.5:1
Packard	6000	32.40	4	4½x5½	349.9	17.1:1
Pope Hartford	6000	.....	...	.....	.....	....
Peerless	6000	32.40	4	4½x6½	413.5	14.5:1
Progress	6000	32.40	4	4½x5½	349.9	17.1:1
Speedwell	6000	29.0	4	4¼x6¾	383.0	15.6:1
Standard	6000	32.4	4	4½x5½	349.9	17.1:1
Schleicher	6000	40.	4	5 x5	392.7	15:1
Schacht	6000	29.0	4	4¼x5½	312.	19.2:1
Universal	6000	25.60	4	4 x5½	276.5	21.7:1
U. S.	6000	32.4	4	4½x5½	349.9	17.1:1
Velie	6000	32.4	4	4½x5½	349.9	17.1:1
Vulcan	6000	30.65	4	4⅜x5½	330.7	18.1:1
Ware	6000	29.0	4	4¼x5½	312.	19.2:1
White	6000	22.5	4	3¾x5⅛	226.4	26.5:1

Load Capacity and Piston Displacement of Trucks of 7000 and 8000 Pounds

NAME	Load Capacity in Pounds	Society Automobile Engineers Horsepower	Number of Cylinders	Bore and Stroke	Piston Displacement in Cubic Inches	Ratio of Load in Pounds per Cubic Inch of Piston Displacement
Alco	7000	40.	4	5 x6	481	14.5:1
Blair	7000	32.4	4	4½x5½	349.9	20:1
De Dion Bouton	7000	25.60	4	4 x 6	301.6	23.3:1
Elk	7000	32.4	4	4½x5½	349.9	20:1
KisselKar	8000	38.25	4	4⅞x5	373.3	21.1:1
Knickerbocker	8000	32.40	4	4½x5	318.1	25.1:1
Kadix	8000	32.40	4	4½x5½	349.9	22.8:1
King	7000	32.40	4	4½x5½	349.9	20:1
Kelly	7000	32.40	4	4½x6½	413.5	16.9:1
Longest	8000	40.00	4	5 x5½	431.9	18.7:1
Lord Baltimore	8000	36.15	4	4¾x5½	389.9	20.5:1
Packers	8000	44.20	4	5¼x6	519.5	15.4:1
Peerless	8000	32.40	4	4½x6½	413.5	19.3:1
Speedwell	8000	40.	4	5 x5	392.7	20.3:1
Sternberg	8000	36.15	4	4¾x5½	389.9	20.5:1
Schacht	8000	29.00	4	4¼x5½	312.	25.6:1
Transit	7000	32.40	4	4½x5	318.1	22:1
Vulcan	8000	30.65	4	4⅜x5½	330.7	24.2:1

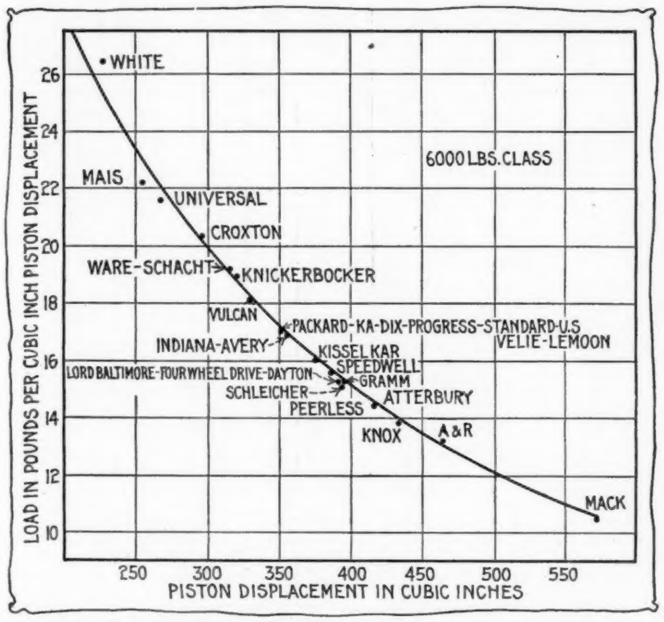


Fig. 6—The 6000-pound class is popular, but shows considerable diversity in ratio

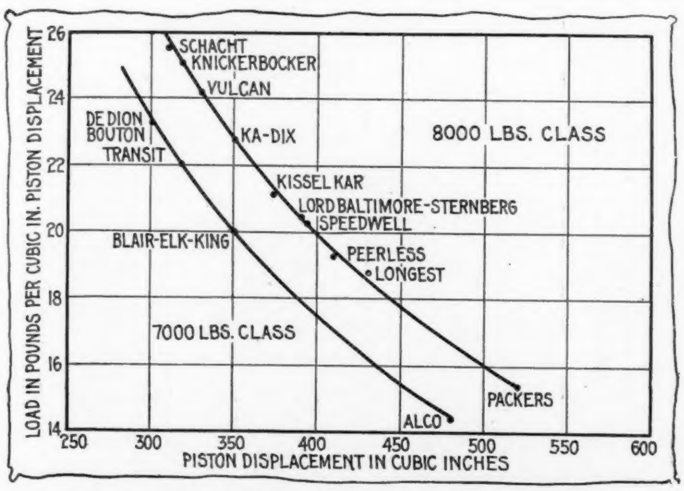


Fig. 7—The 7000 and 8000-pound classes, charted together, showing a slight variation in load-displacement ratio

bocker is rated at 32.4, and, when piston displacement is considered, the Vulcan shows 14 cubic inches more.

The curve, Fig. 8, is a very interesting one as it shows the differences of opinion of the designers of the various makers therein represented. It must be admitted that a variation between 32 pounds and 14 pounds useful load per cubic inch of piston displacement is a very wide range, but on carefully analyzing the chart it will be seen that there are only four makers who run below 21 pounds, so that in point of fact the range is nearer 20 to 30 pounds.

11,000 Pounds and Upwards

¶ Trucks with a load capacity of 10,000 and upwards must necessarily be made heavy to carry the weight of the load and when the weight of the body and chassis are added it is no uncommon occurrence to find that the combined weights total 20,000 pounds and over. Engines with 5-inch bore seem to be the general average for this class, and as the speed of these vehicles must necessarily be restricted if the tires are to last any length of time irrespective of the excessive vibration that is engendered above a certain speed which is most detrimental to the entire mechanism, this size of motor should seem to be ample for most conditions. The solution of the load displacement ratio problem in the case of this class seems to lie in the degree of efficiency of the motor and the correct speed reduction ratios, be they in the gearbox or the final reduction at the sprockets. The initial effort to move this weight from rest must involve a great strain upon the entire mechanism and as speed is not the main factor, general efficiency is more to be sought. This class of truck is primarily intended for the short to medium haul and its handling must be understood in order to obtain satisfactory results.

In order to show at a glance the variations in motor capacity as compared with load ratio in the various classes of trucks Fig. 9 has been prepared. It will be noticed that the curves representing the different capacities are more or less the true arcs of circles and in many cases these have a common radius.

While it is true that a small motor may be more efficient than one considerably larger or a large motor may be more economical than a smaller one of a different make, nevertheless, in order to understand the question of motor capacity as compared with load ratio, it will perhaps be better to strike a general average. It cannot be stated too emphatically that piston displacement *per se* is not the most important factor in engine analysis, as by it alone very little can be determined. It must be presumed that other conditions are equal, such as engine speed, compression, valve area, carburetion, ignition and transmission efficiency. With this clearly in mind, the accompanying tables have been analyzed and the following figures obtained showing the average S. A. E. rated horsepower and the average ratio of load in pounds per cubic inch piston displacement for the various classes of trucks for 1913.

Load Capacity and Piston Displacement of Trucks of 10,000 Pounds and Over

NAME	Load Capacity in Pounds	Society Automobile Engineers Horsepower	Number of Cylinders	Bore and Stroke	Piston Displacement in Cubic Inches	Ratio of Load in Pounds per Cubic Inch of Piston Displacement
A. I. C.	10000	29.0	4	4¼x6¾	383.0	26.1:1
Atterbury	10000	38.25	4	4⅞x5½	410.6	24.4:1
Alco	10000	40.	4	5 x6	481.	20.8:1
De Dion Bouton	10000	29.	4	4¼x6	340.4	29.3:1
Durable Dayton	10000	44.20	4	5¼x7	606.1	16.5:1
Elk	10000	32.4	4	4½x5½	349.9	28.8:1
Gramm	10000	40.	4	5 x5	392.7	25.4:1
KisselKar	10000	38.25	4	4⅞x5	373.3	26.5:1
Knickerbocker	10000	32.40	4	4½x5	318.1	31.4:1
Kadix	10000	32.40	4	4½x5½	349.9	28.8:1
Lewis	10000	36.15	4	4¾x5½	389.9	25.6:1
Locomobile	10000	40.	4	5 x6	471.2	21.2:1
Lord Baltimore	10000	44.20	4	5¼x7	606.1	16.5:1
Mack	10000	48.48	4	5½x6	570.2	17.5:1
Old Reliable	10000	36.15	4	4¾x5½	389.9	25.6:1
Packard	10000	40.0?	4	5 x5½	431.9	23.1:1
Pierce Arrow	10000	38.25	4	4⅞x6	448.0	20.1:1
Peerless	10000	32.40	4	4 11/16x6	413.5	24.2:1
Sternberg	10000	36.15	4	4¾x5½	389.9	25.6:1
Stearns	10000	36.15	4	4¾x6	414.2	24.1:1
Schleicher	10000	57.70	4	6 x6½	735.1	13.6:1
Vulcan	10000	30.65	4	4⅜x5½	330.7	30.2:1
White	10000	29.0	4	4¼x5¾	326.3	30.7:1
Aries	14000	40.0	4	5 x5¾	451.6	31:1
Alco	13000	40.0	4	5 x6	481.	27:1
Mack	15000	48.48	4	5½x6	570.2	26.3:1
Speedwell	12000	40.	4	5 x5	392.7	30.5:1
Vulcan	12000	36.15	4	4¾x5½	389.9	30.7:1

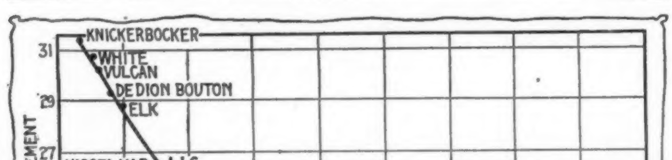


Fig. 8—The 10,000-pound class is represented by twenty-one makers, the ratio varying from 31 to 14 pounds per cubic inch piston displacement

Average Horsepower of 200 Truck Motors

Load in Pounds	Average Horsepower	Average ratio in pounds useful load per cubic inch piston displacement
1500 and under	22.5	6.96:1
2000	25.	8.47:1
3000—4000	28.8	13.16:1
5000—6000	32.7	17.76:1
7000—8000	34.4	20.55:1
10,000	37.4	24.17:1
11,000—15,000	40.9	29.06:1

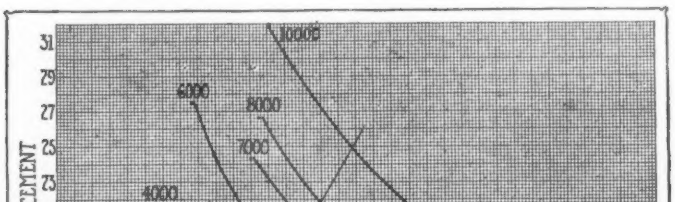


Fig. 9—Composite chart showing the different load-capacity ratio curves of various makes of trucks as well as the average load-displacement ratio

The Gasoline Truck

Trucks and Delivery Vehicles Classified According to Load Capacity; Price and Body Sizes

Facts for the Buyer

THE field of commercial vehicles has considerably broadened during the last year and at present the buyer has a greater variety of offerings than heretofore. Despite the fact that several makers have abandoned truck manufacture there are, in round figures, twenty more makers listed herein this year than last. The number of models has also materially increased by about 100.

The 1-ton class finds the largest number of adherents, next to which in point of numbers comes the 3-ton class. The 2-ton class, with forty-eight models, ranks third. The 5-ton category shows a total of forty-five models, the same number being true of the 1,500-pound class. There are thirty-four types of chassis offered in the 1,000-pound class, ranging anywhere from the 400-pound utility wagon to the 1,000-pound inclosed panel body style.

There seems to be considerable diversity of opinion upon the matter of price, and owing to the considerable variations that will be found by a careful scrutiny of the tabulations the buyer's choice will largely depend upon the peculiar conditions met within his business as to his requirements.

The general average price for the 1,000-pound wagon is anywhere between $750 to $850. The 1,500-pound wagon, however, does not seem to offer any happy medium, as one make of car lists around $800 whereas another with the same capacity lists at $2,500. The general average of prices runs between $1,400 and $1,700, naturally with some above and some below these figures.

The 1-ton capacity class which has already been mentioned offers the buyer the greatest choice from the point of view of number of models. The prices range from $1,000 to $2,250 with perhaps a mean average of $1,750 to $1,800, for the chassis.

The 3,000-pound class is not so important from the point of view of numbers as the 1-ton. The prices range from $1,750 to $3,000 with a mean average of $2,400. The 2 to 2.5-ton class ranges between $1,800 and $3,500 with an average of $2,800 to $3,000. The 3 to 3.5-ton class ranges between $2,700 and $4,000 with an average of $3,400 to $3,500. The 4-ton class ranges in price from $3,200 to $4,500, averaging slightly less than $4,000. The 5-ton contingent range between $4,000 and $5,000 in price, with a few selling for less than $4,000.

Vehicles Under 1-Ton Capacity

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	Load Space: Width	Load Space: H'ght	Load Space: Length	Over-all Length
Akron, A	1500	$1350	Panel	$1500	4' 6"	4' 6"	6'	13'8"
Akron, A	1500	1350	Express	1475	4'	......	6'	13'8"
Akron, A	1500	1350	Open Ex.	1460	4'	......	6'	13'8"
Akron, A	1500	1350	Stake	1475	4'	......	6'	14'9"
Anglaize, B	1500	1000	Express	1050	3'10"	......	7'11"	8'1"
Armleder, C	1500	1250	Open Ex.	1375	4'	......	7'	16'
Armleder, C	1500	1250	Express	1400	4'	5' 4"	7'	16'
Armleder, C	1500	1250	Panel	1500	3' 6"	5' 2"	5' 2"	13'
Armleder, C	1500	1250	Stake	1325	4'	3'10"	7'	16'
Atterbury, A	1500	......	Optional	......	3' 6"	5'	6' 6"	14'
Available, 15	1500	800	Express	875	3 8"	1'	7'	10'6"
Available, 15	1500	800	Closed	925	3' 8"	4' 6"	7'	10'6"
Available, 15	1500	800	Panel	1000	3' 8"	4' 6"	7'	10'6"
Available, 15	1500	800	Stake	875	3' 8"	4' 6"	7'	10'6"
Bessemer, K	1000	1150	Open Ex.	1250	3'10"	......	7'	13'
Bessemer, K	1000	1150	Stake	1225	5'	......	7' 6"	13'6"
Bessemer, K	1000	1350	Panel	1350	3' 8"	......	7'	13'
Bessemer, K	1000	1150	Furnit	1250	5'	......	7' 6"	13'6"
Best, A and B	1000	......	......	......	......	......	......	10'
Brockway, A	1000	......	Express	950	3' 8"	10"	6' 2"	9'6"
Brockway, A	1000	......	Panel	1100	3' 8"	5'	5' 6"	9'
Brooks, A	800	600	......	625	3'	......	5' 6"	10'
Brooks, B	800	600	......	650	3'	4' 6"	5'	10'
Brooks, C	800	600	......	675	3'	4' 6"	5'	10'
Brown	1500	1600	Open Ex.	......	3' 8"	2' 8"	7' 6"	14'7"
Brown	1500	1600	Panel	......	3' 8"	2' 8"	7' 6"	14'7"
Brown	1500	1600	Stake	......	4' 6"	3' 8"	7' 6"	14'7"
Brown	1500	1600	Screen	......	3 8"	2' 8"	7' 6"	14'7"
Bucklen, A	1500	1400	Op. Ex.	1450	3' 9"	......	9' 2"	9'3"
Bucklen, A	1500	1400	Stake	1490	5' 5"	......	10'	10'
Bucklen, A	1500	1400	Delivery	1490	3' 9"	5'	7' 6"	7'9"
Cameron	800	......	Express	725	3'	4' 7"	4' 8"	12'
Cameron	800	......	Van	775	3'5½"	4' 7"	6' 3"	12'
Chase, M	500	......	Express	500	4' 4"	......	4'10"	10'5"
Chase, M	500	500	Panel	600	4' 4"	2' 9"	4'10"	10'5"
Chase, D	1000	855	Express	900	3' 6"	......	5' 6"	12'6"
Chase, D	1000	855	Stake	950	Opt...	......	Opt...	12'6"
Chase, D	1000	855	Panel	1050	3' 8"	5'	5'	12'6"
Cino, 440-D	1500	1300	......	1600	3'10"	4'10"	5'	12'8"
Crawford, 13-30	1200	1300	Delivery	1450	3' 8"	5'	6'	13'
Crawford, 13-30	1200	1300	Delivery	1400	3' 8"	5' 2"	6'	13'
Crown, A	$1500	$1250	......	$1350	3' 8"	4' 2"	6'	13'6"
Dart	......	950	Optional	......	Opt...	Opt...	Opt...	Opt...
Day-Utility, D	......	......	Combi	1500	Opt...	Opt...	Opt...	Opt...
Detroit, 111	1000	900	Open Ex.	950	3' 8"	......	5' 6"	12'
Detroit, 111	1000	900	Stake	950	3' 9"	......	5' 6"	12'
Detroit, 111	1000	900	Panel	975	3' 8"	......	5' 6"	12'
Detroit, 111	1000	900	Panel	985	3' 8"	......	5' 6"	12'
Dispatch, L	1000	800	Panel	900	3'	4' 9"	7'	14'6"
Dispatch, L	1000	800	Delivery	850	3'	......	7'	14'6"
Dispatch, L	1000	800	Furnit	850	3'	......	7'	14'6"
Dispatch, L	1000	800	Laund'y	900	3'	......	7'	14'6"
Dispatch, N	1000	800	Grocer	850	3'	......	6'	14'6"
Dorris H	1500	2100	Optional	......	Opt.	Opt.	Opt...	Opt...
Ford, T	1000	750	Optional	......	Opt...	Opt...	Opt...	Opt...
Gabriel, G	......	900	Optional	......	......	......	......	......
Geneva, B	1200	1250	Open Ex.	1300	3' 9"	......	5' 3"	12'
Geneva, C	1000	1250	Panel	1350	3' 9"	4' 8"	4'10"	12'
Gleason, 10	1000	......	Open Ex.	1050	3' 6"	......	6'	14'
Gleason, 10	1000	......	Canopy	1100	3' 6"	6'	6'	14'
Gleason, 10	1000	......	Panel	1150	3' 6"	6'	6'	14'
Handy Wagon	500	390	Optional	......	2' 7"	......	2' 8"	8'6"
Handy Wagon	800	487	Optional	......	2' 3"	......	3'10"	8'6"
Hart-Kraft, B	1000	......	Optional	825	......	......	......	......
Hart-Kraft, BX	1500	......	Optional	900	......	......	......	......
Hart-Kraft, G	1500	1800	Express	1950	......	......	......	......
Hart-Kraft, G	1500	1800	Panel	250	......	......	......	......
Hatfield, J	1000	850	Express	950	3' 8"	......	6' 6"	10'6"
Hatfield, J	1000	850	Stake	950	4'	......	7' 6"	11'6"
Hatfield, K	......	......	Optional	Opt...	Opt...	Opt...	Opt...	Opt...
Hupmobile, HT	800	850	Panel	950	3' 4"	4'10"	4' 4"	6'
Ideal, I	1500	1500	Optional	......	Opt...	Opt...	Opt...	Opt...
I. H. C., A	1000	......	Open Ex.	......	3' 6"	10'	6' 4"	......
I. H. C., M	......	......	Optional	......	Opt...	Opt...	Opt...	Opt...
Kearns, A	1000	850	Laund'y	1150	Opt...	Opt...	Opt...	Opt...
Kearns, A	1225	850	Optional	......	3' 5"	4' 7"	5'	......
Kearns, A	1075	850	Optional	1150	Opt...	Opt...	Opt...	Opt...
KisselKar	1500	1500	Stake	1625	3' 8"	......	6' 9"	......
KisselKar	1500	1500	Express	1625	3' 8"	......	6' 9"	......

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	LOAD SPACE Width	H'ght	Length	Over-all Length
Klinekar, 2-16...	1250	$1250	Optional	......	Opt...	Opt...	Opt...	Opt..
Koehler.........	1600	725	Open Ex.	$750	3' 8"	4' 8"	7'	12'
Koehler.........	1600	725	Can. Top	790	3' 8"	4' 8"	7'	12'
Koehler, A......	1600	725	Closed...	800	3' 8"	4' 8"	6' 6"	12'
Koehler.........	1600	725	Panel....	900	3' 8"	4' 8"	7'	12'
Koehler, B......	1000	725	Panel....	825	3' 8"	4' 8"	7'	12'
Koehler.........	1600	725	Stake....	775	3' 8"	4' 8"	7'	12'
Krebs, A........	1500	1375	Express..	1510	3' 9"	......	8'	8'6"
Krebs, A........	1500	1375	Screen...	1550	3' 9"	4' 6"	8'	8'6"
Krebs, A........	1500	1375	Stake....	1510	3' 6"	......	8'	8'6"
Lambert........	1500	1125	Panel....	1300	3' 8"	......	6'	......
Lambert........	1500	1125	Stake....	1200	3' 8"	......	6'	......
Lambert........	1500	1125	Express..	1200	3' 8"	......	6'	......
Lincoln, 27......	800	625	Panel....	785	......	......	......	......
Lincoln, 29......	800	625	Open Ex.	685	......	......	......	......
Lipp.-Stewart, B.	1500	1650	Panel....	......	3' 9"	4'10"	7'	15'
Lipp.-Stewart, B.	1500	1650	Stake....	......	4'10"	......	7'	16'
Lipp.-Stewart, B.	1500	1650	Express.	......	3' 9"	4'10"	7'	15'1½"
Luck Utility.....	1000	......	Delivery.	......	......	......	......	......
Marmon........	1500	2500	Optional	......	Opt...	Opt...	Opt ..	Opt...
Mason, 12.......	1000	......	Delivery.	800	3' 6"	4'	3' 7"	12'
Mason, 12.......	1200	......	OpenDel.	800	3' 6"	......	5' 5"	12'
Mason, 10.......	1600	......	Delivery.	1000	3' 6"	......	7' 2"	13'
Menominee, A...	1500	1125	Express..	1200	3' 6"	......	6' 6"	13'6"
Menominee, A...	1500	1125	Stake....	1200	5'	......	7'	14'6"
Menominee, A...	1500	1125	Panel....	1300	3' 6"	......	6' 6"	13'6"
Mercury, P......	1000	......	Panel ...	875	3' 3"	5'	7' 2"	9'
Mercury, P......	1000	......	Open Ex.	750	3' 3"	......	7' 2"	9'
Mercury, P......	1000	......	Panel....	900	3' 3"	5'	7' 2"	9'
Modern, B.......	1000	1200	Optional	......	3' 8"	1'	6'	14'
Modern, BX.....	1000	1350	Optional	......	......	......	......	......
Modern, BR.....	1000	1225	Optional	......	3' 8"	1'	8'	14'
Modern, A.......	1500	......	Open Ex.	1750	3' 9"	1'	7' 6"	15'8"
Modern, AX.....	1500	......	Open Ex.	1750	3' 9"	1'	10'	15'8"
Mora, 20........	1500	950	Open Ex.	1000	3' 9"	......	6' 8"	12'9"
Mora, 20........	1500	950	Open Ex.	1064	3' 9"	......	8'	14'2"
Mora, 20	1500	950	Open Ex.	1178	5' 9"	5'	8'	14'2"
Mora, 20	1500	950	Grocery..	1200	3' 9"	5'	6' 8"	12'9"
McIntyre, E.....	1500	1500	Optional	......	5'	......	8' 3"	15'4"
Moore, C........	1500	1350	Optional	......	3' 8"	......	6' 8"	13'1"
Motorette, L1....	400	......	Delivery.	400	2' 7"	1'11"	3' 3"	9'4"
Motorette N1†...	500	......	Delivery.	500	2' 7"	2' 3"	4'	9'
Oliver, A........	1500	1250	Express..	1350	3' 8"	......	6'	12'
Oliver, A........	1500	1250	Screen...	1400	3' 8"	4' 6"	6'	12'
Oliver, A........	1500	1250	Panel....	1450	3' 8"	4' 6"	6'	12'
Oliver, A........	1500	1250	Brew'y..	1400	4' 1"	4' 6"	6'	12'
Oliver, B........	1500	......	Optional	2200	Opt...	Opt...	Opt...	Opt...
Reo, H..........	1500	700	Express..	750	4'	......	6'	11'
Reo, H..........	1500	700	Stake....	750	4'	......	7'	12'
Rowe, A........	1500	......	......	......	......	......	......	......
Sandusky, B.....	1500	1650	Express..	1750	3'10"	1' 3"	7' 6"	......
Sandusky, B.....	1500	1650	Panel....	1800	3'10"	5' 6"	6' 6"	......
Sandusky, B.....	1500	1650	Stake....	1750	3'10"	......	7' 6"	......
Schacht, MB4....	1800	......	Delivery.	......	......	......	......	......
Schmidt.........	1000	975	Open Ex.	......	Opt...	Opt...	Opt...	Opt...
Schmidt.........	1500	1025	Optional	......	Opt...	Opt...	Opt...	Opt...
Seitz............	1500	1500	Optional	......	Opt...	Opt...	Opt...	Opt...
Service, J.......	1500	......	Open Ex.	......	4'	......	8'	15'6"
Service, J.......	1500	......	Panel....	......	3' 6"	4' 6"	8'	15'6"
Service, J.......	1500	......	Stake....	......	5' 6"	......	8'	15'6"
Stegeman.......	1500	1600	Panel....	......	4'	......	8'	13'
Stewart.........	1500	1650	Panel....	1800	3' 9"	5'	7'	14'6"
Stewart.........	1500	1650	Express..	1775	3' 9"	5'	7'	14'6"
Stewart.........	1500	1650	Stake....	1775	5'	......	7'	14'6"
Stewart...	1500	1650	Open Ex.	1775	3' 9"	......	7'	14'6"
Sullivan, 20.....	1000	925	Optional	1050	3' 2"	4' 9"	5' 1"	8'6"
Sullivan, 51.....	1500	950	Furnit...	1125	3'10"	......	9'	......
Sullivan, 51.....	1500	950	Coal.....	1125	3'10"	......	7' 6"	......
Sullivan, 51.....	1500	950	Plumb'r.	1075	3'10"	......	7' 6"	......
Sullivan, 51.....	1500	950	Stake....	1090	4'	......	7' 6"	......
Tulsa, 10........	1500	1500	Express..	1650	Opt...	11'	8'	15'
Wagenhals......	800	......	Open Ex.	600	3' 4"	2' 6"	5'10"	12'6"
Wagenhals......	800	......	Cl. Ex...	600	3' 4"	2' 6"	5'10"	12'6"
Warren, 12-30...	1000	......	Express..	1325	......	......	......	......
White, GBE.....	1500	2100	Express..	2250	3' 7"	5'	6'10"	14'10"
White, GBE.....	1500	2100	Platf'm..	2250	5'	2'	6'10"	14'10"
Wolverine, C....	1000	800	Express..	850	3' 6"	1'	6'	11'3"
Wolverine, C....	1000	800	Panel....	900	3' 6"	3' 6"	6'	11'3"
Wolverine, C....	1000	$800	Stake....	$875	4'	......	6'	11'.."
Zimmerman, T...	800	450	Open Ex.	700	3'	2' 6"	5' 6"	8'6"

Vehicles of 1-Ton Capacity

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	LOAD SPACE Width	H'ght	Length	Over-all Length
Adams, A.......	3000	......	Optional	$2100	3'10"	......	8'10"	......
Angiaize, D......	2000	$1850	Optional	1900	......	......	......	......
Armleder, B.....	2000	2200	Express..	2300	4' 4"	......	8'	18'
Armleder, B.....	2000	2200	Express .	2350	4' 4"	6'	8'	18'
Armleder, B.....	2000	2200	Screen...	2400	4' 4"	6'	8'	18'
Armleder, B.....	2000	2200	Panel....	2450	4' 4"	6'	7'	18'
Armleder, B.....	2000	2200	Stake....	2300	4' 4"	6'	8'	18'
Atterbury, B.....	2000	......	Optional	......	4'	5' 6"	8'	16'
Available, 24....	2000	1250	Express..	1350	3' 8"	1' 2"	7' 6"	11'6"
Available, 24....	2000	1250	Stake....	1350	3' 8"	1' 2"	7' 6"	11'6"
Available, 24....	2000	1250	Grocery..	1400	3' 8"	4' 6"	7' 6"	11'6"
Available, 24....	2000	1250	Panel....	1500	3' 8"	4' 6"	7' 6"	11'6"
Autocar, 21......	3000	2150	Optional	......	Opt...	Opt...	Opt...	Opt...
Beck...........	2000	......	Platf'm..	1250-	4' 6"	4'	9' 6"	16'
Bergdoll, C-30...	2600	......	Ex-Del..	1600	......	......	......	......
Bessemer, B.....	2000	1800	Express..	1900	4'	5'	8' 6"	14'6"
Bessemer, B.....	2000	1800	Stake....	1880	5'	......	9'	15'
Bessemer, B.....	2000	1800	Panel....	2000	3' 9"	4'	8'	14'
Bessemer, C.....	3000	1800	Express.	2250	4'	4'	10'	15'6"
Bessemer, C.....	3000	1800	Stake....	2175	5'	......	10' 6"	15'6"
Bessemer, C.....	3000	1800	Panel....	2300	3' 9"	3' 5"	9' 6"	15'6"
Best...........	Opt..	......	Optional	......	Opt...	Opt ...	Opt...	Opt...
Blair, C.........	3000	3000	Express..	3150	4' 6"	1'	10'	15'8"
Brockway, B....	2000	......	Express..	1250	3' 8"	1' 2"	4' 6"	10'6"
Brockway, B....	2000	......	Panel....	1450	3' 4"	5'	6' 6"	10'
Brockway, C....	2500	2500	Express..	1400	3' 8"	1' 2"	7' 6"	10'6"
Brockway, C....	2500	......	Panel....	1600	3' 4"	4'10"	6' 6"	10'2"
Bucklan, B......	3000	1700	Open Ex.	1795	3' 9"	......	9'	17'6"
Bucklan, B......	3000	1700	Stake....	1825	5' 5"	......	10'	17'6"
Cameron........	2000	1300	Express..	1400	3' 7"	1' 4"	8' 2"	......
Cameron........	2000	1300	Stake. ..	1400	4'	1' 3"	8' 6"	13'
Cameron........	2000	1300	Express..	1400	3' 7"	1' 3"	8' 2"	13' [illegible]
Cass...........	2500	1850	Optional	2000	Opt...	Opt...	Opt...	Opt...
Chase, H........	2000	1200	Express..	1250	3' 9"	......	6' 6"	13'3"
Chase, H........	2000	1200	Stake....	1300	3' 9"	......	6' 4"	13'3"
Chase, H........	2000	1200	Panel....	1450	3' 9"	4'10"	6'	13'3"
Chase, K........	2000	1350	Express..	1400	3' 9"	......	6' 6"	13'3"
Chase, K........	2000	1350	Stake....	1450	3' 9"	......	6' 4"	13'3"
Chase, K........	2000	1350	Panel....	1600	3' 9"	4'10"	6'	13'3"
Chase, L........	3000	1675	Express..	1750	4'	......	7' 6"	1[illegible]'
Chase, L........	3000	1675	Stake....	1825	4'	......	7' 6"	1[illegible]'
Chase, L........	3000	1657	Panel....	1950	Opt...	Opt...	Opt...	14'
Clark, C........	Opt...	2000	Optional	......	......	......	......	14'
Clark, D........	......	2000	......	......	......	......	......	14'
Clark, E........	Opt...	2150	......	......	......	......	......	16'
Coleman........	2000	1800	Open Ex.	1900	3' 8"	......	8' 4"	14'2"
Coleman........	2000	1800	Express..	2000	3' 8"	......	8' 4"	14'2"
Coleman........	2000	1800	Stake....	1900	3'10"	......	10'	14'10"
Continental, AE..	3000	1850	Optional	1950	4'	6'	11'	15'
Continental, AE..	2000	1850	Optional	2000	4'	1'	12'	10'
Crescent........	2000	......	Optional	......	......	......	......	......
Crown, B.......	2000	1450	....	1550	3' 8"	1' 2"	7'	14'6"
Crown, C.......	3000	2000	....	2125	Opt...	1' 2"	Opt..	16'
Dart............	3000	1800	Box.....	......	4'	......	8' 4"	......
Decatur, B......	3000	2500	Stand...	......	Opt...	Opt...	Opt...	Opt...
Diamond, T-J....	3000	2250	Optional	Opt...	Opt...	Opt...	Opt...	Opt...
Eclipse, B-2.....	2000	1900	Stake ...	2000	Opt...	Opt...	Opt...	Opt ..
Eclipse, B-2.....	2000	1900	Express..	2000	Opt...	Opt...	Opt...	Opt...
Eclipse, B-2.....	2000	1900	Express..	2030	Opt...	Opt...	Opt...	Opt...
Eclipse, B-2.....	2000	1900	Panel....	2100	Opt...	Opt...	Opt...	Opt...
Eclipse, B-2.....	2000	1900	Stake....	2000	Opt...	Opt...	Opt...	Opt .
Erving..........	3000	......	Optional	......	......	......	......	......
Federal, C.......	2000	1800	Optional	......	Opt...	Opt...	Opt...	Opt...
Federal, D.......	2000	1800	Optional	Opt...	Opt...	Opt...	Opt...	Opt...
Four-Wheel Drive, G......	3000	3600	Stake....	3750	5'	3'	11'	11'4"
Gabriel, H.......	......	1350	Optional	......	......	......	......	......

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	LOAD SPACE Width	H'ght	Length	Over-all Length
Gabriel, J		$2200	Optional					
G. M. C., VC	2500		Optional		Opt...	Opt...	Opt...	Opt...
Gramm, 1	2000	1750	Optional		Opt...	Opt...	Opt...	Opt...
Hart-Kraft, E	2000							
Hart-Kraft, C	3000							
Hercules, E	2000		Express	$1775	4' 6"	1'	9' 6"	15'
Hercules, E			Stake					
Ideal, H	2000	1750	Optional		Opt...	Opt...	Opt...	Opt...
Ideal, H-2	2000	2000	Optional		Opt...	Opt...	Opt...	Opt...
Ideal, G	3000	2250	Optional		Opt...	Opt...	Opt...	Opt...
Indiana, H	3000	2000	Optional		Opt...	Opt...	Opt...	Opt...
Johnson, A	2000		Express	2000				
Johnson, A	2000		Stake	2000				
KisselKar	2000	2000	Optional	2125	3' 8"		8'	
Kelly, K-30	3000	2100	Optional	2250	4' 5"		9'	
Kopp, H	3000		Platf'm	2500				
Lambert	2000	1700	Stake	1800				
Lambert	2000	1700	Express	1800				
Lange, C	2000	2250	Optional		3' 8"	Opt...	7' 6"	13'6"
Lange, D	3000	2600	Optional		4' 2"	Opt...	8' 6"	14'6"
Lauth-Juerg., K	2000	2100	Optional		Opt...	Opt...	Opt...	Opt...
Little Giant, D	2000	1050	Open Ex.	1100	3' 8"	1' 1"	7' 6"	12'7"
Little Giant, D	2000	1050	Optional	1150	3' 8"	4'10"	7' 6"	12'7"
Little Giant, D	2000	1050	Optional	1200	3' 4"	4'10"	6' 6"	11'11"
Lord Balti., C	2000	2100	Stake		Opt...		9' 6"	17'6"
Mack, 1 ton	2000	2500	Optional		Opt...	Opt...	9' 6"	17'6"
Mack, 1½ ton	3000	2750	Optional		Opt...	Opt...	Opt...	Opt...
Mais	3000	2750	Optional					
McIntyre, A	3000	2300	Express	2450	5'		Opt...	Opt...
Menominee, B	2000	1400	Express	1500	3' 8"		8' 6"	15'7"
Menominee, B	2000	1400	Stake	1500	5'		8' 6"	15'7"
Monitor, D	2000	1700	Express	1750	4'		8'	11'
Monitor, C	2000	1600	Stake	1650	4'		8'	11'
Monitor, E	3000	1850	Express	1950	4'		9'	13'
Moreland, B	2000		Optional		Opt...	Opt...	Opt...	Opt...
Natco, 15		1925	Optional				9' 6"	Opt...
Nelson & Le-Moon, D-1	2000	2000	Optional		Opt...	Opt...	Opt...	Opt...
Nyberg	3000							
Piggins	2000	1750	Optional	1875	3'10"	3'	9' 8"	14'
Plymouth, D-2	2000	1750	Van		4'	5' 6"	8'	13'
Progress, A	3000		Brewery	2900	5'	3'	10'	14'7"
Progress, A	3000		Express	2850	5'	1'	10'	14'7"
Progress, A	3000		Platf'm	2800	5'	4"	10'	14'7"
Randolph, 1 ton	2000		Optional	1750	Opt...	Opt...	Opt...	Opt...
Robinson, B	3000		Express		4'6"		10'	
Rowe, B	2000		Optional			2'11"		10'
Rowe, C	3000		Optional			2'11"		10'
Schmidt, C	2000	1375	Optional		Opt...	Opt...	Opt...	Opt...
Sampson	3000	2500	Platf'm	2600	5'	2' 7"	9'	14'
Sampson	3000	2500	Delivery	2650	5'	5' 7"	9'	14'
Sampson	3000	2500	Open Ex.	2600	5'	1'10"	9'	14'
Sampson	3000	2500	Panel	2850	4'	5'10"	8'	13'
Sandusky, C	3000	2500	Express	2625		1' 3"	9' 6"	
Sandusky, C	3000	2500	Stake	2600			9' 6"	
Sanford, J	2000	1400	Optional	1500	3' 9"	1' 4"	Opt...	Opt...
Sanford, K	2000	1660	Optional	1750	3' 9"	1' 4"	Opt...	Opt...
Schacht, 16	2000		Delivery		4'	5' 8"	9'	17'2"
Selden, J	2000	2000	Furnit		5' 6"		10'	
Selden, J	2000	2000	Stake		5' 6"		10'	
Selden, J	2000	2000	Box		3'10"		9'	
Service, K	2000		Express		4'	4' 6"	8'	15'6"
Service, K	2000		Panel		3' 6"	4' 6"	8'	15'6"
Service, K	2000		Stake		5' 6"		9'	16'6"
Service, M	3000		Express		5' 5"	5'	9'	17'
Service, M	3000		Stake		5' 6"		9'	17'
Service, M	3000		Panel		3' 6"	4' 8"	8'	16'
Service, M	3000		Express		5' 5"		9'	17'
Stegeman	2000	2250	Optional				Opt...	
Studebaker, 75T	2500		Optional					
Superior, A	2000	1700	Express		3'10"		8' 8¾"	

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	LOAD SPACE Width	H'ght	Length	Over-all Length
Toledo A	2000	$1700	Optional	$1850	4'	3' 2"	Opt...	
Wilcox, I	2000	2300	Optional		Opt...	Opt...	Opt...	Opt...
Wilcox, K	3000	2500	Optional		Opt...	Opt...	Opt...	Opt...
Transport, A	3000	2300	Express	2450	5'	Opt...	Opt...	Opt...
Triumph	3000	1800	Optional	Opt...	Opt...	Opt...	Opt...	Opt...
Tulsa, 1 ton	2000	2000	Stake	2150	Opt...	4'	9'10"	17'10"
Tulsa, 1½ ton	3000	2200	Stake	2350	Opt...	4' 9"	9'10"	17'10"
Universal, C	2000	1950	Optional		5'	Opt...	10'	17'
V.C., B	3000	2350						
Veerac, B	2000	1100	Open Ex.	1150	3' 6"	9' 6"	7' 4"	11' 4"
Veerac, B	2000	1100	Stake	1175	3'11"		7' 4"	11' 4"
Veerac, B	2000	1100	Express	1250	3' 6"	4' 4"	7' 4"	11' 4"
White, GTB	3000	3000	Express	3150	4' 4"	4' 7"	9' 2"	17' 3"
White, GTB	3000	3000	Platf'm	3150	5' 4"	1'11"	9½"	17' 5"
White, Star, C	3000	2250	Optional	Opt...	Opt...	Opt...	Opt...	Opt...
White, Star, B	3000	1750	Optional	Opt...	Opt...	Opt...	Opt...	Opt...
Wichita, A	2000	1650	Stake	1760	4½"		8'	
Wichita, A	2000	1650	Express	1780	3' 9"		8'	
Wichita, A	2000	1650	Express	1750	3' 9"		8'	
Wichita, A	2000	1650	Panel	1800	3' 7"	4' 8"	6'10"	

Vehicles of 2-Ton Capacity

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	LOAD SPACE Width	H'ght	Length	Over-all Length
Adams, D	4000		Optional		Opt...	Opt...	Opt...	Opt...
Alco	4000	$2950	Optional		Opt...	Opt...	Opt...	Opt...
Armleder, D	4000	2400	Optional		Opt...	Opt...	Opt...	Opt...
Atterbury, C	4000		Optional		4' 6"	5' 6"	10'	18'
Avery, A	4000	2700						
Blair, D	5000	3250	Stake	$3400	5' 2"	2' 6"	Opt...	Opt...
Beck	4000		Truck	1500	4' 6"	5'	10'	16'
Cass	5000	2650	Optional		Opt...	Opt...	Opt...	Opt...
Chase, J	4000	2100	Express	2200	4'		9'10"	15'3"
Chase, J	4000	2100	Stake	2300	4' 4"		9'11"	15'3"
Chase, J	4000	2100	Panel	2500	4'	6'	9' 8"	15'3"
Colman	4000	2300	Stake	2400	Opt...	Opt...	Opt...	Opt...
Colman	4000	2300	Express	2500	Opt...	Opt...	Opt...	Opt...
Colman	4000	2300	Open Ex.	2400	Opt...	Opt...	Opt...	Opt...
Crescent	4000		Optional		Opt...	Opt...	Opt...	Opt...
Dur. Dayton, H	4000	2650	Stake	2800	4' 5½"	3'	10' 8"	15'10"
Dur. Dayton, H	4000	2650	Express	2800	4' 3"	1'10"	10' 9½"	15'10"
Elk, C	4000	2600	Stake		4' 6"	Opt...	Opt...	Opt...
G.M C., SC	4000		Optional		Opt...	Opt...	Opt...	Opt...
Gramm, 2	4000	2600	Optional		Opt...	Opt...	Opt...	Opt...
Gramm's B.A.	4000							
Hart-Kraft, H	4000		Optional		Opt...	Opt...	Opt...	Opt...
Hart-Kraft, D	5000		Optional		Opt...	Opt...	Opt...	Opt...
Indiana	4000	2500						
Jarvis-Hunting'n.	4000	2750	Panel	3200	Opt...		10'	
Jarvis-Hunting'n.	4000	2750	Delivery	3050	Opt...		10'	
Jarvis-Hunting'n.	4000	2750	Delivery	2900	Opt...		10'	
Jarvis-Hunting'n.	4000	2750	Furnit	3000	Opt...		10'	
Jarvis-Hunting'n.		2750	Stand	3050				
Jarvis-Hunting'n.	4000	2750	Stake	2900	Opt...		10'	
Johnson, B	4000	2000	Express					
Johnson, B	4000	2000	Stake					
Kissel-Kar	4000	2750	Optional	2900	5'		10'	
Knox, R-3	4000	3000	Wagon	3275	5'		11'	15'9"
Knox, R-3	4000	3000	Platf'm	3325	5'		11'	15'9"
Knox, R-3	4000	3000	Van	3450	5'	6' 6"	11'	15'9"
Knox, R-3	4000	3000	Panel	3450	5'	6' 6"	11'	15'9"
Lambert	4000	2100	Stake	2200	3' 6"			
Lambert	4000	2100	Express	2200	3' 6"			
Lange, B	4000	3000	Optional		4' 6"	Opt...	10'	16'6"
Lauth-Juerg's, L	4000	2800	Optional		Opt...	Opt...	Opt...	Opt...

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	LOAD SPACE Width	H'ght	Length	Overall Length
Lewis, 21	5000	$3250	Express	$3500	5′	1′ 6″	11′	19′6″
Lewis, 21	5000	3250	Platf'm	3400	5′	1′ 6″	11′	19′6″
Lewis, 21	5000	3250	Brewery	3500	5′	1′ 6″	11′	19′6″
Lewis, 21	5000	3250	Dump	3500	4′ 6″	1′10″	10′	19′6″
Lewis, 21	5000	3250	Dump	3600	6′	1′ 6″	9′	19′6″
Lewis, 21	5000	3250	Furnit	3600	5′	5′	11′	19′6″
Lewis, 21	5000	3250	Lumber	3400	6′	......	11′	19′6″
Lord Baltimore	4000	2500	Stake	......	6′	......	10′	18′
Mack, 2 ton	4000	3000	Optional	......	Opt...	Opt...	Opt...	Opt...
Mais	4000	2950	Optional	......	Opt...	Opt...	Opt...	Opt...
Mogul, G	4000	2800	Optional	......	Opt...	Opt...	Opt...	18′4″
Moreland, E	......	......	......	......	......	......	......	......
Nelson LeMoon D	4000	2500	Optional	Opt...	Opt...	Opt...	Opt...	Opt...
Packard	4000	2800	Optional	......	Opt...	Opt...	Opt...	Opt...
Plymouth, G-2	4000	2600	Express	......	4′ 6″	5′ 8″	10′	15′
Randolph, N	4000	2250	Express	......	......	......	......	......
Reo, J	4000	1800	Optional	......	5′ 2″	9′ 7″	1′	6′6″
Robinson, D	4000	2500	Optional	......	Opt...	Opt...	Opt...	Opt...
Rowe, D	4000	......	Optional	......	......	3′ 9″	......	12′
Schacht, 18	4000	......	Panel	......	4′ 8″	......	10′	16′10″
Speedwell, Y	4000	2850	Optional	2950	Opt...	Opt...	Opt...	Opt...
Stegeman	4000	2950	Optional	......	Opt...	Opt...	Opt...	10′8″
Sternberg	4000	2850	Optional	......	5′	Opt...	Opt...	Opt...
Toledo, B	4000	2400	Optional	2600	4′ 2″	3′ 6″	Opt...	......
Transit, F	4000	2850	Optional	3000	5′	......	14′	20′
U.S., E	4000	2800	Optional	......	5′	Opt...	10′	16′6″
Velie, Y	5000	......	Stake	......	5′ 6″	......	10′	19′
Ware, A	4000	3500	......	3700	5′ 5″	3′ 6″	9′	17′
White Star, D	4000	2750	Optional	Opt...	Opt...	Opt...	Opt...	Opt..
Wichita, B	4000	2100	Stake	2250	5′ 6″	......	10′	......
Wichita, B	4000	2100	Express	2275	3 9″	......	9′	......
Wichita, B	4000	2100	Open Ex.	2225	3′ 9″	......	9′	......
Wichita, B	4000	2100	Panel	2300	3′ 9″	......	8′	......
Willet	4000	2850	......	......	5′	......	12′	......

Vehicles of 3-Ton Capacity

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	LOAD SPACE Width	H'ght	Length	Overall Length
A. & R	6000	$3500	Express	......	Opt..	Opt...	Opt...	Opt...
A. & R	......	3500	Brewery	......	Opt...	Opt...	Opt...	Opt...
A. & R	......	3500	Coal	......	Opt...	Opt...	Opt...	Opt...
A. & R	......	3500	Furnit	......	Opt...	Opt...	Opt...	Opt...
Alco, 3½ ton	7000	3650	Optional	......	Opt...	Opt...	Opt...	Opt...
Atterbury, D	6000	......	Optional	......	6′	6′	12′	19′
Avery, A	6000	......	Farm T.	......	4′ 4″	......	10′ 4″	......
Avery, B	6000	......	Stand	......	6′ 4″	......	12′	12′6″
Barker, B	6000	3100	Stake	$3200	6′	......	14′	14′
Barker, B	6000	3100	Express	3200	6′	......	14′	14′
Barker, B	6000	3100	Van	3500	6′	......	14′	14′
Beck	6000	.....	....	1800	4′ 6″	5′	10′ 6″	18′
Blair, E	7000	3750	Stake	3900	5′ 6″	2′ 6″	Opt...	Opt...
Bucklen, C	6000	2400	Stake	2575	5′ 5″	......	16′	22′
Bucklen, C	6000	2400	Open Ex.	2525	3′ 9″	......	15′	21′6″
Couple Gear, HC	7000	4850	Stake	5000	5′ 6″	6′	14′	18′6″
Crescent	6000	......	Optional	......	Opt...	Opt...	Opt...	Opt...
Diamond T, G	6000	3400	Optional	......	Opt...	Opt...	Opt...	Opt...
Dur. Dayton, K	6000	3400	Stake	3600	5′ 7″	3′ 3″	12′ 1″	17′7″
Dur. Dayton, K	6000	3400	Express	3600	5′ 4″	2′	12′ 1″	17′7″
Eclipse, D	6000	3000	Stake	3200	Opt...	Opt...	Opt...	Opt...
Eclipse, D	6000	3000	Express	3200	Opt...	Opt...	Opt...	Opt...
Elk, B	6000	$3400	Optional	......	Opt...	......	Opt...	Opt...
Elk, B	6000	3400	Dump	......	......	......	......	14′8″
Four-Wheel Drive B	6000	4000	Stake	$4150	5′	4′	11′	11′4″
Freighton, G	6000	3200	Platf'm	......	6′	......	12′	19′
Freighton, G	6000	3200	Stake	......	6′	......	15′	21′
G.M.C., H	7000	......	Optional	......	4′ 5″	Opt...	Opt...	Opt...
G.M.C., HL	7000	......	Optional	......	4′ 5″	Opt...	Opt...	Opt...
G.M.C., HM	7000	......	Optional	......	4′ 5″	Opt...	Opt...	Opt...
Gramm, 3	6000	3500	Optional	......	Opt...	Opt...	Opt...	Opt...
Gramm's, B. A	7000	......	Optional	......	Opt...	Opt...	Opt...	Opt...
Indiana	6000	3200	Express	......	4′ 4″	......	12′	......
Indiana	6000	3200	Stake	......	6′	......	12′	......
Jarvis, 3½ ton	7000	3500	Delivery	3875	Opt...	Opt...	12′	......
Jarvis, 3½ ton	7000	3500	Open Ex.	3675	Opt...	......	12′	......
Jarvis, 3½ ton	7000	3500	Furnit	3800	Opt...	......	12′	......
Jarvis, 3½ ton	7000	3500	Oil tank	4000	Opt...	......	12′	......
Jarvis, 3½ ton	7000	3500	Stake	3700	Opt...	......	12′	......
KaDix, C	6000	3500	Optional	......	6′ 6″	......	12′	19′3″
KaDix, C	6000	3500	Optional	......	6′ 6″	......	14′	19′3″
KaDix, C	6000	3500	Optional	......	6′ 6″	......	15′	19′3″
KaDix, C	6000	3500	Optional	......	6′ 6″	......	17′	19′3″
Kato, H	6000	......	Stake	3500	6′	......	12′	15′6″
King, 3	7000	3350	Optional	......	6′	......	13′	17′6″
Kisselkar, 3 ton	6000	3350	Optional	3500	6	......	12′ 4″	......
Kelly, K-40	7000	3500	Optional	3650	4′10″	......	12′ 4″	12′4″
Knickerbocker, 12-3	6000	3500	Optional	......	Opt...	Opt...	Opt...	Opt...
Knox, R-15	6000	3700	Platf'm	4050	6′	......	12′	......
Knox, R-15	6000	3700	Express	4050	6′	......	12′	......
Kopp, L	6000	......	Optional	......	Opt...	Opt...	Opt...	Opt...
Lauth-Juerg., M	6000	3450	Optional	......	Opt...	Opt...	Opt...	Opt...
Lord Baltimore, A	6000	3250	Stake	......	6′	......	13′	17′4″
Mack, 3 ton	6000	4000	Optional	......	Opt...	Opt...	Opt...	Opt...
Mais	6000	3400	Optional	......	Opt...	Opt...	Opt...	Opt...
Moreland, 13-F	6000	......	Optional	......	Opt...	Opt...	Opt...	Opt...
Nelson LeMoon, D-3	6000	3000	Optional	......	Opt...	Opt...	Opt...	Opt...
Old Reliable, 2	6000	2750	Optional	......	Opt...	Opt...	Opt...	17′
Packard	6000	3400	Optional	......	Opt...	Opt...	Opt...	Opt..
Peerless, TC	6000	3700	Optional	......	6′	Opt...	12′	19′6″
Peerless, TC	6000	3700	Optional	......	6′	Opt...	14′	21′6″
Pope-Hartford	6000	3350	Optional	3550	6′ 6″	......	14′	18′1½″
Pope-Hartford	6000	......	Optional	3675	6′ 6″	......	16′	20′1½″
Pope-Hartford	6000	3350	Cab Top.	3600	......	......	......	......
Progress, B	6000	3500	Brewery	3700	6′	3′ 6″	12′	16′11″
Progress, B	6000	3500	Trunk	3600	6′	......	12′	16′11½
Progress, B	6000	3500	Package	3700	6′	3′ 6″	12′	16′11½
Progress, B	6000	3500	Bottle	3800	5′ 9″	......	14′ 3″	17′11½
Rowe, E	6000	......	Optional	......	......	4′	......	12′
Sampson	6000	3400	Platf'm	3550	5′ 6″	3′ 3″	12′	17′
Sampson	6000	3400	Open Ex.	3600	5′ 6″	1′10″	12′	17′
Sampson	6000	3400	Delivery	3650	5′ 6″	7′	12′	17′
Seagrave, F	6000	......	......	......	4′ 2″	......	8′	20′
Schacht	6000	......	Barrels	......	5′ 6″	......	11′ 6″	18′8″
Schacht	6000	......	Furnit	......	5′ 8″	6′10″	12′ 6″	19′8″
Schacht	6000	......	Ice	......	5′	3′ 8″	12′	19′2″
Schacht	6000	......	Coal D'p.	......	5′ 6″	......	10′	18′2″
Schleicher	6000	4000	Optional	......	Opt...	Opt...	Opt...	Opt...
Standard	6000	2750	Optional	......	Opt...	Opt...	10′ 3″	17′4″
Standard	6000	2750	Optional	......	Opt...	Opt...	12′ 3″	19′4″
Standard	6000	2750	Optional	......	Opt...	Opt...	15 3″	22′4″
Standard	6000	2750	Optional	......	Opt...	Opt...	20′ 3″	27′4″
Stegeman	6000	3500	Optional	......	Opt...	Opt...	Opt...	Opt...
Sternberg	6000	3400	Optional	......	5′ 6″	......	12′	......
Sternberg	6000	3400	Optional	......	5′ 6″	......	15′	......
Transit, T	7000	3500	Express	3700	5′ 6″	......	14′	20′
Transit, T	7000	3500	Stake	3650	5′ 6″	......	14′	20′
Transit, T	7000	3500	Comb	3700	5′ 6″	......	14′	20′
Transit, T	7000	3500	Rear D'p	4000	5′ 4″	......	12′	18′
Universal, A	6000	......	Platf'm	3525	6′	......	12′ 4″	17′
U.S., D	6000	3500	Optional	......	6′	......	12′	19′6″

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	LOAD SPACE Width	H'ght	Length	Over-all Length
Velie, Z	7000	$3350	Stake....	$3500	6' 6"		14'	21'
Velie, Z	7000	3350	Optional		Opt...	Opt...	Opt...	Opt...
Victor	6000	2750	Optional		Opt...	Opt...	Opt...	Opt...
Vulcan	6000	3600	Optional		Opt...	Opt...	Opt...	Opt..
White, GTA	6000	3700	Platf'm..	3850	6' 6"	2' 5"	3' 3"	20'7½"
Wilcox, J	6000	3250	Optional		Opt...	Opt...	Opt...	Opt..

Vehicles of 4-Ton Capacity

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	LOAD SPACE Width	H'ght	Length	Over-all Length
A. & R., 4-ton	8000	$3700	Optional		Opt...	Opt...	Opt...	Opt...
Johnson, C	8000	3200	Optional		Opt...	Opt...	Opt...	Opt...
KaDix, D	8000	4000	Optional		Opt...	Opt...	Opt...	Opt...
KisselKar	8000	3650	Stake....	$3800	6'		13'	
KisselKar	8000	3650	Express..	3800	6'		13'	
Longest, 3A	8000	4000	Optional		Opt...	Opt...	Opt...	Opt...
Lord Baltimore, E	8000	3750	Stake....		6'		14'	18'4"
Mack, 4-ton	8000	4250	Optional		Opt...	Opt...	Opt...	Opt...
Mogul, O		3800	Optional					18'2"
Packers, E	8000		Express..		6'		12'	19'2"
Packers, E	8000		Express..		5' 6"	5' 6"	12'	19'2"
Peerless, TC	8000	4000	Optional		6'	Opt...	Opt...	Opt...
Randolph, A	8000		Optional	3600		2'11"	13'	
Schacht, 21	8000		Brewery.		5' 6"		11' 6"	18'8"
Schacht, 21	8000		Furnit...		5' 8"	6'10"	12' 6"	19'8"
Schacht, 21	8000		Ice......		5'	3' 8"	12'	19'2"
Schacht, 21	8000		Stake....		6' 6"	4'10"	12'	19'2"
Schacht, 21	8000		Coal.....		5' 6"		10'	18'2"
Speedwell, Z	8000	3750	Optional	3850	Opt..	Opt...	Opt...	Opt...
Stegeman	8000		Optional		Opt...	Opt...	Opt...	Opt...
Sternberg	8000	4000	Optional		6'		15'	
Studebaker, 77T	8000		Optional		Opt...	Opt...	Opt...	Opt...
Vulcan	9000	4500	Optional		Opt...	Opt..	Opt...	Opt...
Vulcan	8000	4000	Optional		Opt...	Opt...	Opt...	Opt...

Vehicles of 5-Ton Capacity

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	LOAD SPACE Width	H'ght	Length	Over-all Length
A. & R	10000	$4350	Optional					
A.I.C., B	10000	3500	Ice......	$3750	6'	4'	12'	17'
Alco	10000	4750	Optional					
Atterbury, E	10000				6'	6'	12'	19'
Avery, B	10000		Standard		6' 4"		14'	14'8"
Barker, B	10000	3100	Express..	3700	6'		14'	14'
Barker, B	10000	3100	Stake....	3700	6'		14'	14'
Barker, B	10000	3100	Van.....	4000	6'		14'	14'
Couple Gear AC	10000	5400	Stake....	5600	6'	6'	14'	18'6"
Diamond T, G	10000	3600	Optional		Opt...	Opt...	Opt...	Opt...
Dayton, M	10000	4500	Stake....	4700	5'9½"	3' 3"	13' 1"	18'7"
Dayton, M	10000	4500	Express..	4700	5' 7"	2' 1"	13' 3"	18'7"
Elk, E	10000	4100	Standard				14' 2"	18'8"
Elk, E	10000	4100	Short....				12' 7"	17'1"
Elk, E	10000	4100	Dumb...				13' 2"	17'8"
G.M.C., K	10000		Optional		4' 5"		Opt...	Opt...
G.M.C., K1	10000		Optional		4' 5"		16'	21'
Gramm	10000	$4500	Optional		Opt...	Opt...	Opt...	Opt...
Jarvis-Hunting'n	10000	4400	Delivery.	$4825	Opt...		14'	
Jarvis-Hunting'n	10000	4400	Delivery.	4600	Opt...		14'	
Jarvis-Hunting'n	10000	4400	Furniture	4775	Opt...		14'	
Jarvis-Hunting'n	10000	4400	Oil tank.	5050	Opt...		14'	
Jarvis-Hunting'n	10000	4400	Stake....	4650	Opt...		14'	
KaDix, E	10000	4500			6' 6"		Opt...	19'3"
KisselKar	10000	4350	Optional	4500	6'		14'	
Knickerbocker, 12-5	10000	4500	Optional		Opt...	Opt...	Opt...	Opt...
Kopp, M	10000							
Lewis, 51	10000	4750	Platf'm..	5000	6' 6"	4'	14'	19'6"
Lewis, 51	10000	4750	Side D'p.	5100	6'	1' 6"	12'	19'6"
Lewis, 51	10000	4750	End D'p.	5000	5' 6"	1'10"	12'	19'6"
Lewis, 51L	10000	4750	Lumber..	5000	7'		14'	19'6"
Locomobile, A	10000	4800						
Lord Baltimore, F	10000	4250	Stake....		6'		15'	19'4"
Mack, 5 ton	10000	4800	Optional		Opt...	Opt...	Opt...	Opt...
Mogul, M	10000	4400	Optional					20'6"
Mogul, V	10000	4400	Lumber..					20'6"
Old Reliable, V	10000	4500	Optional		Opt...	Opt...	Opt...	18'4"
Packard	10000	4500						
Peerless, TC	10000	4500	Optional					
Pierce-Arrow	10000	4500	Optional		Opt...	Opt...	Opt..	Opt...
Pope-Hartford	10000	4350	Platf'm.	4550	6' 6"	3' 5"	14'	19'2"
Pope-Hartford	10000	4350	Stake....	4550	6' 6"	3' 5"	14'	19'2"
Pope-Hartford	10000	4350	Tab Top.	4600	6' 6"	3' 5"	14'	19'2"
Pope-Hartford	10000	4350	Platf'm..	4675	6' 6"	3' 5"	16'	19'2"
Pope-Hartford	10000	4350	Stake....	4675	6' 6"	3' 5"	16'	19'2"
Rowe, F	10000	3150	Optional		Opt...	Opt...	Opt...	Opt...
Sampson	10000	4750	Platf'm..	5000	6'	3' 3"	14'	20'
Saurer	10000	5000	Optional		Opt...	Opt...	Opt...	Opt...
Schleicher	10000	6000	Optional	Opt..	Opt...	Opt...	Opt...	Opt...
Stearns	10000	3800	Stake....	3950	6'		12' 6"	19'6"
Stearns	10000	3900	Stake....	4050	6'		15' 6"	22'6"
Transit, V	10000	4500	Express..	4700	6'		14'	20'
Transit, V	10000	4500	Stake....	4650	6'		14'	20'
Transit, V	10000	4500	Comb...	4700	6'		14'	20'
Transit, V	10000	4500	Dump...	5000	5' 8"		12'	18'
Vulcan	10000		Optional.		Opt...	Opt...	Opt...	Opt...
White, TC	10000	4500	St.Plat ..	4700	6' 6"	2' 5"	13' 3"	20'7½"
White, TKA	10000		Dump ..	5200	6'	Opt...	11' 2"	19'8"

Vehicles Over 5-Ton Capacity

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	LOAD SPACE Width	H'ght	Length	Over-all Length
Alco, 6½-ton	13000	$5200	Optional		Opt...	Opt...	Opt...	Opt...
Hewitt	20000	5500	Optional		Opt...	Opt...	Opt...	Opt...
LaFrance, 6-ton	12500	5500	Platf'm..	$5500	Opt...		Opt...	Opt...
Mack, 7-ton	14000	5300	Optional		Opt...	Opt...	Opt ..	Opt...
Peerless	12000	5000	Optional					
Randolph, R	12000	4500	Optional		Opt...	Opt...	13' 3"	Opt...
Saurer	13000	6000	Optional		Opt...	Opt...	Opt...	Opt...
Speedwell, X	12000	4400	Optional	4500	Opt...	Opt...	Opt...	Opt...
Stegeman	12000		Optional		Opt...	Opt...	Opt...	Opt...
Sternberg, 6-ton	12000	4750	Optional		6'	Opt...	15'	Opt...
Universal Truck	12000							
Victor	10000	3650	Optional		Opt...	Opt...	Opt...	Opt...
Vulcan	12000		Optional		Opt...	Opt...	Opt...	Opt...
Vulcan	15000		Optional		Opt...	Opt...	Opt...	Opt...

Educating the Freight Automobile Driver

Drivers Must Be Taught Operation and Care of the Automobile Mechanism as Well as Delivery Business—Factory and Private Schools and Traveling Demonstrators Instruct the Former Horse Drivers

TO GET the best possible service out of a freight automobile two things are necessary, namely, a truck as perfectly as possible adapted to the specific requirements of the owner's business and a driver equally qualified. The motor truck driver, his selection and his education are the subject of the following article.

The situation has three angles, the selection of the man best fitted for the position for which he is chosen, the education wich must be given to the man to suitably prepare him for his driving and delivery work and, finally, the best method of imparting his education to him. These three points of view may again be subdivided as follows:

1. **Selection of best men:**
   a. Ability and general qualification.
   b. Character.
   c. Age, physical constitution, etc.
2. **Subjects of education:**
   a. Knowledge of the truck, its construction, troubles and repair.
   b. Care of truck, operating speed, etc.
   c. Correct way of loading the truck.
   d. Delivery work.
   e. Economical training.
   f. Moral training.
3. **Methods of education:**
   a. Schools conducted by truck makers.
   b. Work of companies' instructors and demonstrators.
   c. Instruction by experienced truck drivers in owners' employ.
   d. Specially organized schools.

The selection of the men who are to serve as truck drivers must be in the hands of a person fully familiar not only with the construction and nature of automobile trucks, but also of the business in which the machines and their drivers are to be used. A general inquiry among men of this nature has brought out the astonishing fact that the most important quality which makes for a good driver is industriousness coupled with common sense, rather than years of experience with automobile mechanisms.

The majority of men who have had vast experience with truck drivers are unanimous in stating that the best type of truck driver comes from the ranks of the former horse vehicle drivers taught to handle a freight automobile.

The reason for this fact is that a horse driver who is familiar with the delivery business of a certain company will be much easier educated to a truck driver and familiarized with the requirements of an automobile than a chauffeur will learn the delivery business, as this business requires a long and steady training and a good man must have a high degree of responsibility to be worth his wages. This brings us to the critical point of the situation. Chauffeurs of pleasure cars are liberally paid, and often command much higher incomes than truck drivers, although the work of the former is in many cases easier and more pleasant than that of the latter. Consequently there is no inducement for a good chauffeur to come down to the pay of truck driver.

Another point upon which great stress is laid by men who know is the fact that pleasure car chauffeurs are, as a rule, not such hard-working men as truck drivers must be in order to be efficient. The hours of the average chauffeur who drives a pleasure car are short when compared with the working time of a motor truck driver and such an occupation as that of the former does not tend to make a man ambitious and hard working. A man who has worked as a pleasure car chauffeur for any length of time generally begins to consider himself an aristocrat among his fellows and would deem himself degraded if he had to step down to the harder work of the delivery driver, which is not even paid as well. Add all the little pleasures that go with the profession, so-called, of a pleasure car chauffeur, such as a neat livery, the occasional use of the car for his own devices and the consequent social successes, there remains little or no incentive for a chauffeur to join the ranks of his truck brothers. Furthermore, the chauffeurs' profession has occasionally been a goal for capable but morally irresponsible characters whose influence has made itself known at least by the general desire for private gain, which sort of egotism cannot be satisfied if a man works as truck driver. The little niceties which count in the person of a pleasure car driver, such as an attractive exterior and gentlemanly bearing, are likewise superfluous in a truck driver and therefore not paid for by a truck owner and operator.

A former horse driver, on the other hand, improves himself, however slightly, when he advances to the ranks of a truck chauffeur. The improvement is financial as well as moral, since most people's self-consciousness is elated upon changing from the operation of a quadruped to that of a mechanism which does so much more work in a shorter time and, once known in its habits, may be easily governed by the man who knows. The knowledge of the truck mechanism opens, furthermore, to the ambitious man the road to the chauffeurs' profession, to the position of a delivery superintendent or the like, all being factors which tend to make a good man put his best efforts into his work.

It goes without saying that a certain physical ability is requisite for a man's being eligible to the truck drivers' ranks. As a rule, a man who is capable of handling a pair of horses will be physically able to cope with the freight automobile after having been taught the mechanical requirements of the latter. In this connection the age of the man is frequently among the principal factors considered. One of the largest express companies of this country, for instance, only uses men ranging from twenty-one to forty-five years of age, for either the work of the driver or the worker. Men above forty-five after twenty years or so of this sort of work are naturally not quite as quick as when they took it up; nevertheless in a great many cases their accumulated experience and grown brain capacity makes up for this defect, and it is doubtful whether such a hard and fast rule is a better course to adopt than a decision from case to case.

Coming to the second division, the subjects of the driver's education, the knowledge of the automobile and an understanding of its construction and needs seems to stand foremost. It stands to reason that it would be a very expensive process to let a driver take out his truck and if he meets with an accident or slight misadjustment of some part or other of his truck, 20 miles away from the garage, to telephone for a mechanic, merely to have the latter go over the spark-plugs or to locate a short-circuit in the ignition wiring. It is ever so much cheaper to instruct a driver before en-

trusting him with a truck how such minor troubles may be remedied without calling on the aid of an expert. A phase of the education which goes hand in hand with this is to make the driver familiar with the proper care of the freight automobile. The driver should know at what speed he may safely operate his truck over various kinds of road. He should also know the details of lubrication, of keeping the cooling system well filled with water, and so forth.

One point of the education which is half mechanical and half of a delivery-business nature is the proper method of loading a truck. The driver when being instructed should be informed how much weight should be loaded on the various portions of the body and how this should be done to permit of efficient and rapid unloading and delivery. Whatever information is necessary to bring out the points upon which depends the high or low cost of truck operation should be imparted to the driver. He ought to be taught to avoid tire abuse, to properly use and not strain his brakes, to use the motor as a brake in coasting down a hill, to use the top gear whenever possible and to apply every known process to get as much work as possible out of the given quantity of fuel. To complete his education the owner or his representative should instill some definite moral ideas into the men which would tend to make them good workers and to which they would live up if the lessons are brought home in the right manner and spirit; the latter, of course, requires deft work, but the success of various firms operating on modern principles has shown that moral education of the driver pays.

The practice of a truck maker conducting a gratis course for the men who are to drive the trucks manufactured by them is making headway, although not as rapidly as might be expected. It has been proven, however, that the companies who introduced such a school for the benefit of their customers have been amply repaid for their efforts by the reduced measure of trouble encountered with their product later on. In these schools men who are to drive the trucks and are sent in by the buyers of the latter are given a sufficient knowledge of the mechanical side of the truck and the various requirements of the latter, this instruction work taking place in the shop. A little later the men are generally taken out on the road and shown how to drive and how to make repairs in case of trouble.

Other companies, instead of conducting a central school system, send their demonstrators with a newly sold truck, who also serve as instructors to the drivers with whom the handling of the truck is to rest. Some of these companies make also a practice of a periodical inspection of every truck sold and of instructing the drivers on this occasion.

One of the best methods conceivable is the following which, however, can only be used where a number of motor trucks have been in service before a new lot is introduced and a new set of drivers must be educated. **This system is used by some of the largest express companies in New York. It consists in using the most experienced of the companies' drivers as teachers for the recruits, who in this way not only become acquainted with the mechanical side of truck driving, but also get a good idea of the delivery work, the loading problem, etc.**

Finally there are especially organized private schools who teach the men all the things mentioned above.

Following are a few excerpts from letters received by THE AUTOMOBILE in reply to an inquiry as to the stand they are taking with regard to the question of automobile instruction for truck drivers.

What Truck Makers Think of the Education of the Truck Driver

ARDMORE, PA.—The system that the Autocar Company uses in instructing drivers allows for taking a horse driver off from a wagon, putting him through the Autocar course, and turning out a very capable driver. As a matter of fact, we have turned out in Philadelphia alone 1,400 drivers in the past 2 years. It is an earnest desire of the Autocar Company to co-operate at all times with the users of Autocars, who are invited to send their drivers to school in Philadelphia, New York and Boston, where free instruction is given on the care of the cars.—THE AUTOCAR COMPANY.

MOLINE, ILL.—Men are placed on the assembly floor of the Velie factory that they may notice the location of every part, grease cup, etc., and instructed in theory as to the operation of trucks; as a result we find their efficiency much increased and at the same time making better their operation of the truck and its decreased depreciation. The idea has been confined largely to the adjacent factory territory.

We think that idea of training schools in various cities for the education of truck drivers is fine. We believe that all truck manufacturers would be interested in such a proposition.—VELIE MOTOR VEHICLE COMPANY.

SPRINGFIELD, MASS.—The Knox Automobile Company has done a great deal of work of this sort in connection with handling our fire apparatus particularly. Firemen as a rule know very little about automobile motors, to say nothing about the requirements in handling fire trucks, so it is necessary to give them a very thorough course. They are generally men picked for some slight mechanical intelligence.

We start them generally on the motor assembly, where they learn how the motors are put together, as well as the major adjustments. They then go on to the chassis assembly, and finally to the testing department. Here they learn the handling and control of the car and the minor adjustments, thus following their own cars right through the shop.

We believe it would be the height of foolishness to put expensive machines of this sort into the hands of untrained men, or even to risk having them operated by local drivers who might have had driving experience on certain cars but not on ours. This particular arrangement is expensive to our factory and is a source of considerable hindrance to our employees at times, but we find it pays in the long run, and it enables these green men to become much more proficient in handling and taking care of our cars.—KNOX AUTOMOBILE COMPANY.

NEW YORK CITY—The Alco company always has experts available to instruct a driver employed by any of our owners in the operation and care of Alco trucks. This form of service is supplemented by service in the way of sending experts along on the trucks with the new drivers until they become proficient. Furthermore, our inspection system aids the drivers, as we keep in touch with them. Traveling inspectors make the rounds and give drivers the benefit of their advice in such matters as operating economically, proper distribution of loads and general care of the vehicles.—AMERICAN LOCOMTIVE COMPANY.

MINNEAPOLIS, MINN.—The former horse driver makes the best truck driver, but it takes some time to get him properly trained so that he can take care of the mechanical parts. We believe the best method for training this kind of driver is to bring him into the shop and train him for 2 or 3 months until he gets acquainted with the operation of the truck. He then makes a most efficient driver.—H. E. WILCOX MOTOR CAR COMPANY.

FREMONT, O.—The Lauth-Juergens Company believes that it would be a splendid idea if schools were established, providing those attending the schools could get the proper training, not only as to driving of the truck, which is a very small matter, but the detection of trouble, and the ability to repair it, to get that proper training which will overcome his helplessness in case of an accident.—THE LAUTH-JUERGENS MOTOR CAR COMPANY.

NEW YORK CITY—We know of nothing that would help the industry to a greater extent than the establishment of training schools for drivers in fifty or seventy-five of the largest cities in the country. The local auto training schools are not adequate for the purpose, as they have neither equipment in machines nor men to carry out the course of instruction that is of any benefit whatever to the motor truck driver. This is an opportunity for a man of broad mental perspective to further the industry as a whole and himself individually as has never existed in any branch of the motor truck industry. To be of any value, these schools should not only teach the technique of truck driving but they must go into the problem of transportation from the method of handling the goods on the inside of the establishment as well as the inefficiencies of loading and unloading now existing with horse equipment and to a great extent motor truck equipment also.—INTERNATIONAL MOTOR COMPANY.

BUFFALO, N. Y.—As to whether a school for teaching delivery systems would be successful is very problematical. Every line of business has its own peculiarities and details, and it would seem as though it would be extremely difficult to teach a general proposition that would apply to the various lines.—PIERCE-ARROW MOTOR CAR COMPANY.

ELYRIA, O.—The Garford Company has never conducted a class at its factory for educating truck drivers, and we doubt that it will. We have found, however, that the best drivers for motor trucks are found in the ranks of the present drivers of horse-drawn vehicles, and are preferably taken from the force which is to be displaced by the installation of trucks. The reasons for this are many, among which we might say that the most important to the purchaser of the truck is the fact that the driver knows his routes, most of the people to whom he is expected to deliver goods, and is familiar with the methods of doing business.—THE GARFORD COMPANY.

DETROIT, MICH.—The Packard Company in 1907 organized at the factory a school for the instruction of truck drivers in the proper care and operation of Packard machines. The course is 1 month and the class is held from 7.30 a.m. to 4.30 p.m., each day of the week, with 1 hour for lunch. The instructor lectures before the class; then part of the class is taken out by a second instructor for a driving lesson, while the others are examined on the subject taught during the morning.—PACKARD MOTOR CAR COMPANY.

MILWAUKEE, WIS.—We have not to date inaugurated any school for drivers, but have made it a practice to have the drivers of Stegeman trucks come to the factory and give them a thorough instruction in the construction of the chassis, so that they will realize its component parts, their relations to one another and what the operation of different levers actually means. We have found this method very beneficial and is one that should be adopted or followed by every manufacturer.

As regards a training school for truck drivers, this might look good on the face of it, but we are rather inclined to believe that a school of this character cannot long remain independent—that is to say, certain manufacturers will control the instructors and instill into the schools the advantages of certain construction, or in other words, of certain makes of machines.—STEGEMAN MOTOR CAR COMPANY.

Motor Truck Chassis on the 1913 Market

THE AUTOMOBILE Publishes Herewith Its Annual Table of Commercial Vehicles, Covering the Details of Practically Every Gasoline Truck Chassis Produced by Manufacturers of the United States at the Present Time

ON these and the following pages appear the leading mechanical specifications of the various commercial vehicles listed for 1913. These specification tables are based on chassis and not body types. To explain: some of the concerns herein listed with but one, two or three different chassis models may have ten or twelve different bodies, which list of the various body styles of each concern appears in other pages of this issue.

There are a few concerns which do not appear in these specifications solely because it has been impossible to get from them the necessary information on their models. In some cases this has been due to the fact that they are bringing out new ones which they hope to announce immediately after the shows. There are a few concerns which are in more or less uncertain financial conditions and they are not in a position at present to make definite announcements concerning 1913 plans.

This information has all been obtained direct from manufacturers and in places where it is incomplete it has been due to such points not being decided upon. The various columns call for little, if any, explanation. Where optional wheelbases are listed it means that the concerns do this to accommodate the chassis to different body types which call for greatly varying loading platforms.

It is to be regretted that more complete information was not obtainable for the column headed Turning Radius in Feet, as this column refers to the amount of space required to make a complete circle with the vehicle.

I

NAME AND MODEL	Load Capacity Pounds	Chassis Weight Pounds	Turning Radius Feet	Wheelbase	TIRES			No. Cylinders	Bore and Stroke	S. A. E. H. P.	CYLINDERS		Valve Location	Camshaft Drive	COOLING	
					Kind	Front	Rear				Shape	How Cast			Circulation	Radiator Suspension
A & R, 3 ton	6,000	Opt	Opt	Opt	Opt	Opt	Opt	4	5.0x5.8	40.0	L Head	Pairs	Left	Gear	Pump	Springs
A & R, 4 ton	8,000	Opt	Opt	Opt	Opt	Opt	Opt	4	5.0x5.8	40.0	L Head	Pairs	Left	Gear	Pump	Springs
A & R, 5 ton	10,000	Opt	Opt	Opt	Opt	Opt	Opt	4	5.0x5.8	40.0	L Head	Pairs	Left	Gear	Pump	Springs
Adams, D	3,000	3,900	......	140	Solid*	36x3½	36x3	4	3.9x5.0	24.0	L Head	Block	Right	Gear	Pump	Rubber
Adams, A	......	3,200	41	121	Solid*	36x3½	36x4	4	3.9x5.0	24.0	L Head	Block	Right	Gear	Pump	Rubber
A. I. C., B	10,000	8,000	......	136	Solid*	36x6	40x5	4	4.3x6.8	28.9	L Head	Pairs	Left	Hel'l	Pump	Springs
Akron, A	1,500	2,300	27	118	Solid*	34x4	34x4	4	3.8x5.0	24.0	L Head	Block	Right	Hel'l	Pump	Brackets
Alco, 2 ton	4,000	......	......	......	......	......	......	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Trunnions
Alco, 3½ ton	7,000	......	......	......	......	......	......	4	5.0x6.0	40.0	L Head	Pairs	Left	Gear	Pump	Trunnions
Alco, 5 ton	10,000	......	......	......	......	......	......	4	5.0x6.0	40.0	L Head	Pairs	Left	Gear	Pump	Trunnions
Alco, 6½ ton	13,000	......	......	......	......	......	......	4	5.0x6.0	40.0	L Head	Pairs	Left	Gear	Pump	Trunnions
Angaize, B	1,500	2,000	......	100	Solid*	36x2	38x2	2	5.3x4.0	22.1	Straight	Sep'rt	Head	Gear	Thermo	......
Angaize, D	2,000	3,700	20	......	Solid	36x3½	40x4	4	3.8x5.3	22.5	L Head	Block	Right	Gear	Pump	......
Armleder, C	1,500	2,000	28	114	Pneu.	34x4	34x4	4	3.3x4.0	16.9	L Head	Block	Right	Gear	Pump	Springs
Armleder, B	2,900	3,100	34	136	Opt	40x4	40x5	4	4.0x4.5	25.6	L Head	Block	Left	Gear	Thermo	Springs
Armleder, D	......	......	......	......	......	......	......	4	4.5x5.0	32.4	L Head	Block	Right	Gear	Pump	Springs
Armleder, F	......	3,000	37	142	Solid	39x6	39x6	6	4.1x5.3	40.9	L Head	Pairs	Right	Gear	Pump	Springs
Atterbury, A	1,500	3,200	13½	116	Solid	34x3	34x3	4	3.8x4.5	22.5	L Head	Pairs	Left	Gear	Pump	Springs
Atterbury, B	2,000	3,600	15	128	Solid	36x3½	36x4	4	4.0x5.5	25.6	L Head	Pairs	Left	Gear	Pump	Springs
Atterbury, C	4,000	4,300	17½	143	Solid*	36x3½	36x3½	4	4.3x5.5	28.9	L Head	Pairs	Left	Gear	Pump	Springs
Atterbury, D	6,000	5,600	20	153	Solid*	36x4	36x4	4	4.9x5.5	38.0	T Head	Pairs	Opp	Gear	Pump	Springs
Atterbury, E	10,000	6,000	20	153	Solid*	36x5	42x5	4	4.9x5.5	38.0	T Head	Pairs	Opp	Gear	Pump	Springs
Autocar, 21††	3,000	3,300	38	97	Opt	Opt	Opt	2	4.8x4.5	18.1	L Head	Sep'rt	Head	Gear	Pump	Springs
Available, 15	1,500	1,900	34	100	Solid	34x2	34x2	2	5.3x4.0	22.1	L Head	Sep'rt	Left	Gear	Thermo	Springs
Available, 24	2,000	2,250	34	102	Solid	34x2½	34x3	4	3.8x4.5	22.5	L Head	Block	Right	Gear	Thermo	Springs
Avery, B	6,000	6,250	......	128	Solid*	38x5	38x4	4	4.8x5.0	36.1	L Head	Sep'rt	Left	Gear	Pump	Springs
Avery, A	6,000	5,700	......	140	Wood	......	......	4	4.8x5.0	36.1	L Head	Sep'rt	Left	Gear	Pump	Springs
Avery, 5 ton	10,000	7,250	......	140	Solid*	38x6	38x5	4	4.8x6.8	36.1	L Head	Pairs	R & H.	Gear	Pump	Springs
Barker, 3 ton	6,000	5,650	......	150	Solid*	36x3½	36x4	4	5.0x4.8	40.0	L Head	Pairs	Right	Gear	Pump	Springs
Barker, 5 ton	10,000	6,350	......	150	Solid*	36x4	36x5	4	5.0x4.8	40.0	L Head	Pairs	Right	Gear	Pump	Springs
Beck, 2 ton	4,000	2,400	22	130	Solid	36x4	36x5	4	4.0x4.5	25.6	T Head	Sep'rt	Opp	Gear	Pump	Springs
Beck, 3 ton	6,000	2,800	25	130	Solid	36x4	36x6	4	5.0x6.0	40.0	T Head	Sep'rt	Opp	Gear	Pump	Springs
Beck, 1 ton	2,000	2,000	25	128	Solid	34x3½	38x4	4	4.0x4.5	25.6	T Head	Sep'rt	Opp	Gear	Pump	Springs
Bergdoll, C-30	......	2,600	......	115	Solid	34x4	34x4	4	4.0x5.0	25.6	......	Block	......	......	Pump	......
Bessemer, K	1,000	2,075	28	102	Solid	34x2	34x2½	4	3.5x4.5	19.6	L Head	Block	Left	Gear	Thermo	Springs
Bessemer, B	2,000	2,900	33	120	Solid	34x3	34x3½	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Thermo	Springs
Bessemer, C	3,000	3,000	33	136	Solid	34x3½	34x4	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Thermo	Springs
Best, A & B††	1,000	2,100	30	79	......	......	......	2	4.5x4.5	16.2	L Head	Sep'rt	Top	Gear	Thermo	Springs
Best, 1 ton	2,000	......	......	......	......	......	......	4	3.8x4.5	22.5	L Head	Block	Right	Gear	Thermo	Springs
Blair, C	3,000	4,200	......	114	Solid	34x4	34x3	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	Springs
Blair, D	5,000	5,100	......	121	Solid	34x4	34x3½	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Blair, E	7,000	6,600	......	144	Solid	36x5	36x4	4	4.5x5.5	32.4	L Head	Pairs	Right	Gear	Pump	Springs

†Three wheels. ††Two-cylinder opposed. *Drives on four wheels. †††Gas-electric power plant.

ABBREVIATIONS:—Tires: Solid*, solid dual tires in rear. **Cylinders:** Sep'rt, separate. **Valves:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling:** Thermo, thermo-syphon. **Radiator Suspension:** S & T, springs and trunnions. **Ignition:** Sing, single; Doub, double; Gov, governor; Auto, automatic. **Magneto or Generator:** Atw K, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Lubrication:** Spl-Pres, splash and pressure; In Fuel, oil fed with gasoline. **Bore and Stroke:** In decimals to nearest 1-10 inch, as 4.3=4¼ etc., .2=$\frac{3}{16}$, .1=⅛, .3=¼, .4=⅜, .5=½, .6=$\frac{9}{16}$, .7=$\frac{11}{16}$, .8=¾, .9=⅞.

Load Capacity and Complete Specifications

In Calculating the Horsepower of the Motors Given in the Table the S. A. E. Formula Was Followed—That Is, Horsepower Equals the Cylinder Bore Squared, Multiplied by the Number of Cylinders Divided by 2.5

The horsepower given is not necessarily that listed by the manufacturer, but the rating computed by the formula of the Society of Automobile Engineers, which formula is based on cylinder bore and the number of cylinders and only indirectly takes the piston stroke into consideration.

In view of the many requests for gear ratios between the motor and rear wheels it is to be regretted that complete information on this subject was not available because the manufacturers offer such a variety of ratios. The ratio that will suit Chicago is not satisfactory for the same service in hilly cities, such as Cincinnati or San Francisco. Because of this situation wide options are permitted which it would be impossible to list herein.

An interesting column under the head Transmission is that of location, which refers to the position at which the gearbox is mounted in the chassis. Midship means, of course, located by itself at a point approximately midway between the front and rear axle. The other locations are unit with the motor, unit with the jackshaft in chain-driven cars and unit with the rear axle in shaft-driven vehicles.

Under the main heading Running Gear the sub-head Control has reference to whether the steering wheel is placed on the right or left side of the chassis and whether the gear shift lever is on the right side, in the center or on the left side. This also applies to the location and manner of mounting of the emergency brake lever.

G	IGNITION			Carbureter	Motor Lubrication	TRANSMISSSION						RUNNING GEAR					BEARINGS 1	
						Clutch Type	GEARSET			Gear Ratio	Final Drive	SPRINGS		CONTROL				
Radiator uspension	System	Magneto or Generator	Control				Type	Location	No. Forw'd Speeds			Front	Rear	Steering Wheel	Gear-shift	Emergency Brake	Gearset	Rear Axle
prings	Dual		Hand	Stromberg	Spl-Pres	Cone	Sel	Amid	3	4.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	B & R	Roll
prings	Dual		Hand	Stromberg	Spl-Pres	Cone	Sel	Amid	3	2.5-1	Chain	½ Ell	½ Ell	Right	Right	Right	B & R	Roll
prings	Dual		Hand	Stromberg	Spl-Pres	Cone	Sel.	Amid	3	11.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	B & R	Roll
ubber				Schebler	Splash	Disk	Sel	Amid	3	7.5-1	Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Ball
ubber				Schebler	Splash	Disk	Sel	Amid	3	7.5-1	Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Ball
prings	Sing	Simms	Fixed	Schebler	Spl-Pres	Cone	Sel	Amid	3	10.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
rackets	Dual	Remy	Hand	Schebler	Splash	Disk	Sel	Unit M	3	4.0-1	Bevel	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
runnions	Dual	Bosch	Hand	Newcomb	Spl-Pres	Disk	Sel	Amid	3	6.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
runnions	Dual	Bosch	Hand	Newcomb	Spl-Pres	Disk	Sel	Amid	3	7.6-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
runnions	Dual	Bosch	Hand	Newcomb	Spl-Pres	Disk	Sel	Amid	3	13.9-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
runnions	Dual	Bosch	Hand	Newcomb	Spl-Pres	Disk	Sel.	Amid	3	13.9-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
	Dual	Spld'rf	Hand	Schebler	Spl-Pres		Plan	Amid	2		Chain	Ell	Ell	Right		Pedal	Plain	Ball
	Opt	Remy	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	2	8.1-1	Chain	½ Ell	Plat	Right	Right	Left	Plain	Opt
prings	Sing	Bosch	Hand	Schebler	Splash		Fric	Unit M			Chain	½ Ell	½ Fll	Left	Center	Left	Ball	Ball
prings	Sing	Bosch	Hand	Schebler	Spl-Pres	Disk	Sel	Unit M	3		Bevel	½ Ell	½ Ell	Left	Pedal		Ball	Ball
prings	Sing	Bosch	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Plain
prings	Dual	Bosch	Hand	Schebler	Spl-Pres	Disk	Sel	Unit M	4		Bevel	½ Ell	Ell	Left	Center		Ball	Ball
prings	Dual	Bosch	Hand	Stromberg	Spl-Pres	Disk	Sel	Unit M	3		Bevel	½ Ell	½ Ell	Right	Center	Center	Ball	B & R
prings	Doub	Opt	Fixed	Stromberg	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Right	Center	Center	Ball	Roll
prings	Doub	Opt	Fixed	Stromberg	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Right	Center	Center	Ball	Roll
prings	Doub	Opt	Fixed	Stromberg	Spl-Pres	Disk	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
prings	Doub	Opt	Fixed	Stromberg	Spl-Pres	Disk	Sel.	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
prings	Sing	Bosch	Fixed	Stromberg	Splash	Disk	Pro	Amid	3	6.0-1	Bevel	½ Ell	Plat	Right	Right	Right	Roll	Roll
prings	Dual	Briggs	Hand	Schebler	Pressure	Disk	Plan	Unit J	2	5.7-1	Chain	Ell	Ell	Right	Right	Right	B & P.	Ball
prings	Dual	Briggs	Hand	Rayfield	Splash	Cone	Sel	Unit J	3	5.3-1	Chain	Ell	Ell	Right			Ball	Ball
prings	Dual	Eisemann	Auto	Schebler	Splash	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Center	Center	Roll	Roll
prings	Dual	Eisemann	Auto	Schebler	Splash	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right			Plain	Roll
prings	Dual	Eisemann	Auto	Schebler	Spl-Pres	Disk	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Center	Center	Ball	Roll
prings	Dual	Remy	Hand	Optional	Splash	Disk	Sel	Unit J	3	9.0-1	Chain			Right	Right	Right	Ball	Ball
prings	Dual	Remy	Hand	Optional	Splash	Disk	Sel	Unit J	3	9.0-1	Chain			Right	Right	Right	Ball	Ball
prings	Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Unit M	3	8.0-1	Chain	½ Ell	½ Ell	Right	Center	Right	Roll	Roll
prings	Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Unit M	3	8.0-1	Chain	½ Ell	½ Ell	Right	Center	Right	Roll	Roll
prings	Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Unit M	3	8.0-1	Chain	½ Ell	½ Ell	Right	Center	Right	Roll	Roll
	Dual	Bosch	Hand	Mayer	Splash	Disk	Sel	Unit M	3		Bevel	½ Ell	¾ Ell				Ball	Ball
prings	Sing	Briggs	Hand	Rayfield	Spl-Pres	Cone	Sel	Unit J	3		Chain	½ Ell	Plat	Left	Center	Center	Ball	Ball
prings	Dual	Briggs	Hand	Rayfield	Spl-Pres	Cone	Sel	Unit J	3		Chain	½ Ell	Plat	Left	Center	Center	Ball	Roll
prings	Dual	Briggs	Hand	Rayfield	Spl-Pres	Cone	Sel	Unit J	3		Chain	½ Ell	Plat	Left	Center	Center	Ball	Roll
Springs	Doub		Gov	Marvel	Splash		Fric	Amid		6.1-1	Chain	½ Ell	Ell	Left	Left	Left	Roll	Roll
Springs	Dual	Remy	Hand	Marvel	Splash	Cone	Sel	Amid	3		Bevel	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Springs	Dual	Bosch	Fixed	Schebler	Spl-Pres	Cone	Sel	Amid	3		Bevel	½ Ell	½ Ell	Right			Plain	B & R
Springs	Dual		Fixed	Schebler	Spl-Pres	Cone	Sel	Amid	3		Bevel	½ Ell	½ Ell	Right			Plain	B & R
Springs	Dual		Fixed	Schebler	Spl-Pres	Cone	Sel.	Amid	3		Bevel	½ Ell	½ Ell	Right			Plain	B & R

ABBREVIATIONS:—Clutch: Exp B, expanding band; Con B, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; I. C., individual clutches. **Gearset Location:** Amid, amidships; Unit M, unit with the motor; Unit J, unit with the jackshaft; Unit X, unit with the rear axle. **Drive:** Bevel, shaft with bevel gears at rear axle; Worm, shaft with worm gears at rear axle; Ext G, external gear; Int G, internal gear. **Springs:** ½ Ell, semi-elliptic; Ell, ellipitc; ¾ Ell, ¾ elliptic; Plat, platform. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball roller and plain.

Motor Truck Chassis on the 1913 Market

2

NAME AND MODEL	Load Capacity Pounds	Chassis Weight Pounds	Turning Radius Feet	Wheelbase	TIRES Kind	TIRES Front	TIRES Rear	No. Cylinders	Bore and Stroke	S. A. E. H. P.	CYLINDERS Shape	CYLINDERS How Cast	Valve Location	Camshaft Drive	COOLING Circulation	COOLING Radiator Suspension
Brockway, A	1,000	1,575	30	100	Solid	36x2	38x2½	3	4.0x5.0		2 Cycle	Sep'rt			Air	
Brockway, B	2,000	2,500	30	106	Solid	36x2½	38x3	3	4.0x5.0		2 Cycle	Sep'rt			Air	
Brockway, C	2,500	2,500	30	106	Solid	36x2½	38x3	3	4.0x5.0		2 Cycle	Sep'rt			Air	
Brockway, D	4,000	3,800	30	112	Solid	36x3	38x4	3	4.5x5.0		2 Cycle	Sep'rt			Air	
Brooks, A, B, C	800	900	22	87	Solid	38x1¾	40x1¾	2	3.7x3.7		2 Cycle	Sep'rt			Air	
Brown, 1,500 lb	1,500			122	Opt	Opt	Opt	4	3.7x5.2	22.5	L Head	Block	Left	Gear	Pump	Springs
Bucklen, A	1,500	2,500		120	Solid	32x4	32x4	4	4.5x5.0	32.4	L Head	Pairs	Left	Spiral	Thermo	Springs
Bucklen, B	3,000	3,600		145	Solid	36x3½	37x5	4	4.5x5.0	32.4	L Head	Pairs	Left	Spiral	Thermo	Springs
Bucklen, C	6,000	4,500		160	Solid	36x5	37x7	4	4.5x5.0	32.4	L Head	Pairs	Left	Spiral	Thermo	Springs
Cameron, 1 ton	2,000	2,725	19	108	Solid	36x2½	36x2½	4	3.8x3.7	24.0	Straight	Sep'rt	Head	Gear	Air	
Cameron, 1 ton	2,000	2,725	19	103	Solid	36x2½	36x2½	4	3.8x3.7	24.0	Straight	Sep'rt	Head	Gear	Air	
Cameron	800	1,318	17½	104	Solid	30x3½	30x3½	4	3.8x3.7	24.0	Straight	Sep'rt	Head	Gear	Air	
Cass, 1 ton	2,500	3,200		119	Solid	35x3½	35x4	4	4.0x4.5	25.6	L Head	Block	Right	Gear	Thermo	Trunnions
Cass, 2 ton	5,000	5,000		137	Solid	35x3½	39x3½	4	4.2x5.0	28.9	Straight	Sep'rt	Head	Gear	Pump	Trunnions
Chase, M†	500	1,400	25	84	Solid	34x2	36x2	2	4.1x4.0		2 Cycle	Sep'rt			Air	
Chase, D†	1,000	1,920	32	100	Solid	34x2	36x2	3	4.1x4.0		2 Cycle	Sep'rt			Air	
Chase, H†	2,000	2,300	45	106	Solid	34x2½	36x3	3	4.1x4.0		2 Cycle	Sep'rt			Air	
Chase, K†	2,000	2,600	45	106	Solid	34x2½	36x3	3	4.1x4.0		2 Cycle	Sep'rt			Air	
Chase, L†	3,000	3,200	50	112	Solid	36x3	36x3½	3	4.5x5.0		2 Cycle	Sep'rt			Air	
Chase, J†	4,000	3,900	52	120	Solid	36x3½	36x4	3	4.5x5.0		2 Cycle	Sep'rt			Air	
Cino, 440-D	1,500	2,300		120	Solid	35x4½	35x4½	4	4.5x5.0	32.4	T Head	Block	Opp	Gear	Pump	Springs
Clark, C	3,000	3,000	25	100	Solid	36x3½	36x4	4	3.7x5.0	22.5	L Head	Block	Left	Gear	Thermo	Springs
Clark, D	3,000	3,400	25	100	Solid	36x3½	36x4	4	3.7x5.0	22.5	L Head	Block	Left	Gear	Thermo	Springs
Clark, E	3,000	3,400	25	120	Solid	36x3½	36x4	4	3.7x5.0	22.5	L Head	Block	Left	Gear	Thermo	Springs
Clark, E	3,000	3,400	25	140	Solid	36x3½	36x4	4	3.7x5.0	22.5	L Head	Block	Left	Gear	Thermo	Springs
Coleman, 1 ton	2,000	3,400		110½	Solid	36x3	36x4	4	3.6x5.3	20.3	L Head	Block	Left	Hel'l	Thermo	Springs
Coleman, 2 ton	4,000	4,000		110½	Solid	36x3½	36x5	4	3.6x5.3	20.3	L Head	Block	Left	Hel'l	Thermo	Springs
Continental, AE	3,000	3,000	31		Solid			4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	
Continental, AE	2,000	3,000		120	Solid			4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	
Couple Gear, HC*	7,000	7,500	28	144	Solid*	36x4	36x4	4	5.3x6.0	44.1	T Head	Sep'rt	Opp	Gear	Pump	Springs
Couple Gear, AC*	10,000	8,000	28	144	Solid*	36x5	36x5	4	5.8x6.0	53.0	T Head	Sep'rt	Opp	Gear	Pump	Springs
Crawford, 13-30	1,200	2,400	25	112	Solid	32x3	33x4	4	4.3x4.5	28.9	L Head	Pairs	Right	Spi'l	Pump	
Crescent, 1 ton	2,000	3,600		108	Solid	34x3½	34x3½	4	4.1x4.3	27.3	L Head	Sep'rt	Left		Pump	Springs
Crescent, 2 ton	4,000	4,000		126	Solid*	34x4	34x3½	4	4.5x5.0	32.4	L Head	Sep'rt	Left		Pump	Springs
Crescent, 3 ton	6,000	5,000		136	Solid*	36x5	36x4	4	4.8x5.0	36.1	L Head	Sep'rt	Left		Pump	Springs
Crown, A	1,500	2,400		104	Solid	36x2½	36x2½	4	3.8x4.5	22.5	T Head	Sep'rt	Opp	Gear	Thermo	Trunnions
Crown, B	2,000	2,600		116	Solid	36x3	36x3½	4	4.0x4.5	25.6	T Head	Block	Opp	Gear	Thermo	Trunnions
Crown, C	3,000	3,400		130	Solid	36x3½	36x4	4	4.1x5.0	27.3	T Head	Block	Opp	Gear	Opt	Trunnions
Croxton, 10				121		36x4	36x4	4	4.1x5.5	27.3	L Head	Block	Right	Gear	Thermo	
Dart								4	3.3x5.0	16.9	L Head	Block	Left	Gear	Thermo	Springs
Dart	3,000	3,400	30	130	Solid	34x3½	38x3½	4	4.1x5.5	27.3	L Head	Block	Left	Hel'l	Pump	Springs
Day Utility, D				115	Pneu.	34x4	34x4	4	4.0x4.5	25.6	L Head	Pairs	Left	Gear	Pump	
Decatur, H	3,000	4,000	50	129	Pneu.	34x4½	34x4½	4	3.8x5.3	22.5	L Head	Block	Right	Gear	Pump	Springs
Detroit, Mark III	1,000	1,700	39	100	Solid	32x2	32x2½	4	3.3x3.4	16.9	L Head	Pairs	Left	Gear	Thermo	
Diamond, T. J.	3,000							4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	Springs
Diamond, T. G	6,000							4	5.0x5.5	40.0	L Head	Pairs	Left	Gear	Pump	Springs
Diamond, T. G	10,000							4	5.0x5.5	40.0	L Head	Pairs	Left	Gear	Pump	Springs
Dispatch, L	1,000	1,200	30	120	Opt			4	3.5x5.0		2 Cycle	Sep'rt			Air	
Dispatch, N	1,000	1,200	30	120	Pneu.	36x3½	36x3½	4	3.5x5.0		2 Cycle	Sep'rt			Air	
Dayton, H	4,000	4,850	23	118½	Solid*	36x4	36x3	4	4.3x5.0	28.9	T Head	Pairs	Opp	Gear	Pump	Springs
Dayton, K	6,000	6,575	28	137	Solid*	36x5	36x4	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	Springs
Dayton, M	10,000	8,650	28	148	Solid*	36x6	42x5	4	5.3x7.0	4.1	T Head	Pairs	Opp	Gear	Pump	Springs
Dorris, H	1,500	2,650	40	130	Solid	35x4½	35x4½	4	4.4x5.0	30.6	Straight	Pairs	Head	Gear	Pump	
Eclipse, B, 2	2,000	3,400		106	Solid	34x3	34x3½	4	3.8x5.3	22.5	L Head	Pairs	Left	Gear	Pump	
Eclipse, D	6,000	5,300		120	Solid*	36x5	36x4	4	4.5x5.5	32•4	L Head	Pairs	Left	Gear	Pump	
Elk, 2 ton	4,000	4,000		110	Solid*	36x4	36x3	4	4.1x5.3	27.3	L Head	Block	Right	Hel'l	Pump	Springs
Elk, 2 ton	4,000	4,000		120	Solid*	36x4	36x3	4	4.1x5.3	27.3	L Head	Block	Right	Hel'l	Pump	Springs
Elk, 3 ton	6,000	5,800		124	Solid*	36x5	36x4	4	4.5x5.5	32.4	L Head	Pairs	Right	Hel'l	Pump	Springs
Elk, 3 ton	6,000	5,800		112	Solid*	36x5	36x4	4	4.5x5.5	32.4	L Head	Pairs	Right	Hel'l	Pump	Springs
Elk, 5 ton	10,000	8,400		142	Solid*	36x6	36x5	4	4.5x5.5	32.4	L Head	Pairs	Right	Hel'l	Pump	Springs
Elk, 5 ton	10,000	8,400		130	Solid*	36x5	36x5	4	4.5x5.5	32.4	L Head	Pairs	Right	Hel'l	Pump	Springs
Erving, L	3,000			120	Solid	36x3½	36x3½	4	4.5x5.5	32.4		Pairs			Pump	
Federal, C	Opt	Opt	Opt	Opt	Opt	Opt	Opt	4	4.3x4.5	28.9	L Head	Pairs	Left	Gear	Pump	Springs
Federal, D	Opt	Opt	Opt	Opt	Opt	Opt	Opt	4	4.3x4.5	28.9	L Head	Pairs	Left	Gear	Pump	Springs
Ford, T	750	1,200	28	100	Pneu.	30x3	30x3½	4	3.8x4.0	22.5	L Head	Block	Right	Gear	Thermo	
Fourwheel Drive, G*	3,000	4,700	23	124	Solid	36x4	36x4	4	4.3x5.0	28.9	T Head	Pairs	Opp	Gear	Pump	Trunnions
Fourwheel Drive, B*	6,000	5,800	23	125	Solid	36x5	36x5	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	Trunnions
Gabriel, G††	Opt	Opt	Opt	Opt	Opt	Opt	Opt	2	5.0x4.0	20	L Head	Sep'rt	Side	Gear	Thermo	
Gabriel, H	Opt	Opt	Opt	Opt	Opt	Opt	Opt	4	3.8x5.1	22.5	L Head	Block	Side	Gear	Pump	
Gabriel, J	Opt	Opt	Opt	Opt	Opt	Opt	Opt	4	4.1x5.3	27.3	L Head	Block	Side	Gear	Pump	
Geneva, C	1,000	1,915		96	Solid	34x2	36x2½	2	5.1x4.5	21.0	L Head	Sep'rt	Side	Gear	Thermo	Springs
Geneva, B	1,200	1,915		96	Solid	34x2	36x2½	2	5.1x4.5	21.0	L Head	Sep'rt	Side	Gear	Thermo	Springs

†Three wheels. ††Two-cylinder opposed. *Drives on four wheels. †††Gas-electric power plant.

ABBREVIATIONS:—Tires: Solid*, solid dual tires in rear. **Cylinders:** Sep'rt, separate. **Valves:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling:** Thermo, themro-syphon. **Radiator Suspension:** S & T, springs and trunnions. **Ignition:** Sing, single; Doub, double; Gov, governor; Auto, automatic. **Magneto or Generator:** Atw K, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Lubrication:** Spl-Pres, splash and pressure; In Fuel, oil fed with gasoline. **Bore and Stroke:** In decimals to nearest 1-10 inch, as 4.3=4¼ etc., .2=3/16, .1=⅛, .3=¼, .4=⅜, .5=½, .6=9/16, .7=11/16, .8=¾, .9=⅞.

Load Capacity and Complete Specifications

2

Ignition: System	Ignition: Magneto or Generator	Ignition: Control	Carbureter	Motor Lubrication	Transmission: Clutch Type	Gearset: Type	Gearset: Location	No. Forw'd Speeds	Gear Ratio	Final Drive	Springs: Front	Springs: Rear	Control: Steering Wheel	Control: Gearshift	Control: Emergency Brake	Bearings: Gearset	Bearings: Rear Axle
ng	Bosch	Fixed	Holley	In Fuel		Plan	Amid	2	3.0-1	Chain	Ell	Ell	Right	Pedal	Pedal	B R & P	Ball
ng	Bosch	Fixed	Holley	In Fuel		Plan	Amid	2	3.0-1	Chain	Ell	Plat	Right	Pedal	Pedal	B R & P	Ball
ng	Bosch	Fixed	Holley	In Fuel	Cone	Sel	Amid	3	8.0-1	Chain	Ell	Plat	Right	Center	Center	Roll	Ball
ng	Bosch	Fixed	Holley	In Fuel	Cone	Sel	Amid	3		Chain	Ell	Plat	Right	Center	Center	B R & P.	Roll
ng	Bosch		Kingston	In Fuel		Fric			14.0-1	Roller							
ual	Remy	Hand		Splash	Disk	Sel	Unit M	3		Int G	½ Ell	½ Ell	Left	Center	Center	Ball	Ball
oub	Briggs	Hand	Optional	Spl-Pres	Disk	Sel	Unit M	3	4.5-1	Bevel	½ Ell	½ Ell	Left	Opt	Opt	Roll	Roll
ual		Hand	Optional	Spl-Pres	Disk	Sel	Unit M	3	7.3-1	Chain	½ Ell	½ Ell	Left	Opt	Opt	Plain	Ball
ual		Hand	Stromberg	Spl-Pres	Disk	Sel	Unit M	3	9.3-1	Chain	½ Ell	½ Ell	Left	Center	Center	Plain	Roll
ng		Hand	Kingston	Splash	Cone		Unit J	3	7.0-1	Chain	Ell	Ell	Right	Right	Right	Ball	Ball
ng		Hand	Kingston	Spl-Pres	Cone		Unit J	3	6.0-1	Chain	Ell	Ell	Right	Right	Right	Plain	Ball
ng		Hand	Kingston	Spl-Pres	Cone		Unit X	3	3.0-1	Bevel	½ Ell	Ell	Right	Right	Right	Plain	Ball
pt	Eisemann	Hand	Kingston	Splash	Cone	Sel	Amid	2		Chain	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
pt		Hand	Kingston	Splash.	Disk	Sel	Unit M	4		Chain	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
ng	Bosch	Fixed	Holley	In Fuel		Plan	Amid	2	9.0-1	Chain	Ell	Cross	Left	Pedal			Plain
ng	Bosch	Fixed	Holley	In Fuel		Plan	Amid	2	7.6-1	Chain	Ell	Ell	Right	Pedal			Ball
ng	Bosch	Fixed	Holley	In Fuel		Plan	Amid	2	8.1-1	Chain	Ell	Plat	Right	Pedal			Ball
ng	Bosch	Fixed	Holley	In Fuel	Cone	Sel	Amid	3	7.9-1	Chain	Ell	Plat	Right	Right			Ball
ng	Bosch	Fixed	Holley	In Fuel	Cone	Sel	Amid	3	7.6-1	Chain	Ell	Plat	Right	Right	Right		Ball
ng	Bosch	Fixed	Holley	In Fuel	Cone	Sel	Amid	3	7.6-1	Chain	Ell	Plat	Right	Right	Right		Ball
ual	Opt	Hand	Rayfield	Spl-Pres	Cone	Sel	Unit X	3		Bevel	Ell	¾ Ell	Right	Center	Center	Ball	Ball
ual	Eisemann	Auto	Holley	Splash	Opt	I. C	Amid	3	3.3-1	Bevel	½ Ell	Ell	Right	Right	Right	Roll	B&R
ual	Eisemann	Auto	Holley	Splash	Opt	I. C	Amid	3	3.3-1	Bevel	½ Ell	Ell	Right	Right	Right	Roll	B&R
ual	Eisemann	Auto	Holley	Splash	Opt	I. C	Amid	3	3.3-1	Bevel	½ Ell	Ell	Right	Right	Right	Roll	B&R
ual	Eisemann	Auto	Holley	Splash	Opt	I. C	Amid	3	3.3-1	Bevel	½ Ell	Ell	Right	Right	Right	Roll	B&R
ual	Remy	Hand	Schebler	Splash	Cone	Sel	Amid	3		Chain	Ell	Ell	Right	Right		Roll	Roll
ual	Remy	Hand	Schebler	Splash	Cone	Sel	Amid	3		Chain	Ell	Ell	Right	Right		Roll	Roll
oub	Bosch	Hand	Schebler	Splash	Cone	Sel	Unit J	3	10.0-1	Chain	½ Ell	Plat	Right	Right	Right	Plain	Ball
ual	Bosch		Schebler	Splash	Disk	Sel	Unit J	3	10.0-1	Chain	½ Ell	Plat	Right	Right	Right	Ball	Ball
ual	Mea	Fixed	Stromberg	Splash							½ Ell	½ Ell	Right		Pedal		Roll
ual	Mea	Fixed	Stromberg	Splash							½ Ell	½ Ell	Right	Pedal	Pedal		Roll
ual	Remy	Hand	Stromberg	Spl-Pres	Cone	Sel	Unit X	3	4.0-1	Bevel	½ Ell	Ell	Right	Right	Right	Roll	Roll
	Opt		Schebler	Spl-Pres	Cone	Sel	Unit J	3		Chain	Ell	Ell	Right	Center	Pedal	Roll	Roll
	Opt		Schebler	Spl-Pres	Cone	Sel.	Unit J	3		Chain	Ell	Ell	Right	Center	Pedal	Roll	Roll
	Opt		Schebler	Spl-Pres	Cone	Sel	Unit J	3		Chain	Ell	Ell	Right	Center	Pedal	Roll	Roll
ual	Briggs	Hand		Spl-Pres	Disk	Sel	Amid	3	7.1-1	Chain	½ Ell	Ell	Left	Center	Center	Plain	Ball
ual	Briggs	Hand		Spl-Pres	Disk	Sel	Amid	3	7.1-1	Chain	½ Ell	Ell	Left	Center	Center	Plain	Ball
ual		Hand		Spl-Pres	Disk	Sel	Amid	3	8.0-1	Chain	½ Ell	½ Ell	Left	Center	Center	Plain	Ball
ng	Eisemann	Hand	Schebler	Splash	Disk	Sel		3	3.50-1	Bevel	½ Ell	¾ Ell	Left	Center	Center	Ball	Ball
ng		Fixed	Optional	Splash	Cone	Sel		3		Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Plain
ual	Eisemann	Gov	Stromberg	Spl-Pres	Opt	Sel	Unit J	3		Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
oub	Remy	Hand	Schebler	Splash	Disk	Pro		3		Bevel	½ Ell	¾ Ell	Left	Center	Center	Ball	Roll
ng	Bosch	Hand	Rayfield	Splash	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
ng		Fixed		Spl-Pres		Plan	Amid	2	6.0-1	Chain	½ Ell	Ell	Left	Center	Center		Roll
ual	Bosch	Fixed	Rayfield	Splash	Disk	Sel	Unit M	3		Worm	½ Ell	½ Ell	Right	Center	Center	Roll	Roll
ual	Bosch	Hand	Rayfield	Splash	Disk	Sel	Unit M	3		Worm	½ Ell	½ Ell	Right	Center	Center	Roll	Roll
ual	Bosch	Hand	Rayfield	Splash	Disk	Sel	Amid	3	12.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
ual	Opt	Hand	Maco.	Splash		Fric	Amid		6.3-1	Chain	Ell	Ell	Right	Pedal	Right	Roll	Roll
ual	Opt	Hand	Maco	Splash		Fric	Amid		6.3-1	Chain	Ell	Ell	Right	Pedal	Right	Roll	Roll
oub	Bosch	Hand	Stromberg	Pressure	Disk	Sel	Amid	3	9.2-1	Chain	½ Ell	Ell	Left	Center	Center	Roll	Roll
oub	Bosch	Hand	Stromberg	Pressure	Disk	Sel	Amid	3	9.4-1	Chain	½ Ell	Ell	Left	Center	Center	Roll	Roll
oub	Bosch	Hand	Stromberg	Pressure	Disk	Sel	Amid	3	12.0-1	Chain	½ Ell	Ell	Left	Center	Center	Roll	Roll
ual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
ual	Bosch	Hand	Stromberg	Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	Ell	Right			Plain	Ball
ual	Bosch	Hand	Stromberg	Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	Plat	Right			Plain	Roll
ual	Eisemann	Hand	Schebler	Spl-Pres	Cone	Sel.	Amid	3		Bevel	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
ual	Eisemann	Hand	Schebler	Spl-Pres	Cone	Sel	Amid	3		Bevel	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
ual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
ual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
ual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
ual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
ual		Hand	Schebler	Spl-Pres	Disk	Pro	Amid	3		Chain	½ Ell	Plat					
ng		Fixed	Stromberg	Splash	Cone	Sel	Unit J	3	7.3-1	Chain	½ Ell	½ Ell	Left	Left	Left	Roll	Roll
ng		Fixed	Stromberg	Splash	Cone	Sel	Unit J	3	7.3-1	Chain	½ Ell	½ Ell	Left	Left	Left	Roll	Roll
ng	Own	Hand		Splash	Disk	Plan	Unit M	2		Bevel	½ Ell	Cross	Left	Pedal	Left		
ual	Bosch	Hand	Stromberg	Pressure	Disk	I. C.	Amid	3		Bevel	½ Ell	Plat	Opt	Opt	Opt	Ball	B & R
ual	Bosch	Hand	Stromberg	Pressure	Disk	I. C.	Amid	3		Bevel	½ Ell	Plat	Opt	Opt	Opt	Ball	Ball
ng	Bosch	Hand	Stromberg	Splash		Plan	Amid	2		Chain	½ Ell	½ Ell	Left	Pedal		Plain	Roll
ng		Hand	Stromberg	Spl-Pres	Cone	Sel	Amid	3		Bevel	½ Ell	½ Ell	Left	Center	Center	Plain	Roll
ng		Hand	Stromberg	Spl-Pres	Cone	Sel.	Amid	4		Bevel	½ Ell	½ Ell	Left	Center	Center	Plain	Roll
ng	Bosch	Fixed	Schebler	Spl-Pres	Disk	Plan	Unit J	2		Chain	½ Ell	Ell	Right	Right	Pedal	Ball	Ball
ng	Bosch	Fixed	Schebler	Spl-Pres	Disk	Plan	Unit J	2		Chain	½ Ell	Ell	Right	Right	Pedal	Ball	Ball

BREVIATIONS:—**Clutch:** Exp B, expanding band; Con B, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; I. C., individual clutches. **Gearset Location:** Amid, amidships; Unit M, unit with the motor; Unit J, unit with the jackshaft; Unit X, unit with the rear axle. **Drive:** Bevel, shaft with bevel gears at rear axle; Worm, shaft with worm gears at rear axle; Ext G, external gear; Int G, internal gear. **Springs:** ½ Ell, semi-elliptic; Ell, elliptic; ¾ Ell, ¾ elliptic; Plat, platform. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and ller. B R & P, ball roller and plain.

Motor Truck Chassis on the 1913 Market

3

NAME AND MODEL	Load Capacity Pounds	Chassis Weight Pounds	Turning Radius Feet	Wheelbase	TIRES Kind	TIRES Front	TIRES Rear	No. Cylinders	Bore and Stroke	S. A. E. H. P.	CYLINDERS Shape	CYLINDERS How Cast	Valve Location	Camshaft Drive	COOLING Circulation	COOLING Radiator Suspension
Gleason, 10††	1,000	1,500		96	Solid	36x2	36x2	2	4.8x4.0	18.0	L Head	Sep'rt	Left	Gear	Thermo	
G. M. C., VC	2,500		38	126	Solid	34x3	36x4	4	3.5x5.3	19.6	L Head	Block	Right	Gear	Pump	Springs
G. M. C., VC	2,500		38	148	Solid	34x3	36x4	4	3.5x5.3	19.6	L Head	Block	Right	Gear	Pump	Springs
G. M. C., SC	4,000			142	Solid*	34x4	36x3½	4	4.0x6.0	25.6	L Head	Block	Right	Gear	Pump	Springs
G. M. C., SC	4,000			175	Solid*	34x4	36x3½	4	4.0x6.0	25.6	L Head	Block	Right	Gear	Pump	Springs
G. M. C., H	7,000	6,500	50	Opt	Solid*	36x5	36x4	4	5.0x5.0	40.0	L Head	Pairs	Left	Gear	Pump	
G. M. C., HL	7,000	6,950	60	170	Solid*	36x5	36x5	4	5.0x5.0	40.0	L Head	Pairs	Left	Gear	Pump	
G. M. C., K	10,000	7,600	50	Opt	Solid*	36x6	36x5	4	5.0x5.0	40.0	L Head	Pairs	Left	Gear	Pump	
G. M. C., KL	10,000	8,100	60	170	Solid*	36x6	36x6	4	5.0x5.0	40.0	L Head	Pairs	Left	Gear	Pump	
Gramm, 1 ton	2,000	3,830	20	106	Solid	34x3½	34x3½	4	4.3x4.5	28.9	L Head	Pairs	Right	Gear	Pump	Springs
Gramm, 2 ton	4,000	4,500	22	116	Solid*	36x4	36x3	4	4.3x4.5	28.9	L Head	Pairs	Right	Gear	Pump	Springs
Gramm, 3 ton	6,000	6,830	24	124	Solid*	36x5	36x4	4	5.0x5.0	40.0	L Head	Pairs	Right	Gear	Pump	Springs
Gramm, 5 ton	10,000	8,140	28½	130	Solid*	36x5	40x5	4	5.0x5.0	40.0	L Head	Pairs	Right	Gear	Pump	Springs
Gramm-Bernstein, 2 ton				Opt	Opt	Opt	Opt	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Gramm-Bernstein, 3½ ton	7,000			Opt	Opt	Opt	Opt	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Great Eagle, A				138	Solid	36x4½	36x4½	4							Pump	
Handy, Wagon	500		12	65	Solid	1.1½	1.1½	2	3.8x3.8		2 Cycle	Sep'rt		Gear	Air	
Handy, Wagon	800		17	86	Solid	1.4	1.4	2	4.1x3.8		2 Cycle	Sep'rt		Gear	Air	
Hart-Kraft, B††	1,000				Solid	34x2½	34x2½	2	4.5x4.0	16.2	L Head	Sep'rt	Side	Gear	Thermo	
Hart-Kraft, BX††	1,500				Solid	34x3	34x3	2	4.5x4.0	16.2	L Head	Sep'rt	Side	Gear	Thermo	
Hart-Kraft, G	1,500			114	Solid	34x3	34x3½	4	3.8x5.3	22.5	L Head	Block	Right		Pump	
Hart-Kraft, E	2,000			121½	Solid	34x3½	36x4	4	3.8x5.3	22.5	L Head	Block	Right		Pump	
Hart-Kraft, C	3,000			127	Solid	34x3½	36x5	4	4.1x5.3	27.3	L Head	Block	Right		Pump	
Hart-Kraft, H	4,000			133	Solid*	34x4	36x3	4	4.1x5.3	27.3	L Head	Block	Right		Pump	
Hart-Kraft, D	5,000			140	Solid*	34x4	38x3½	4	4.5x5.5	32.4	L Head	Pairs	Right		Pump	
Hatfield, J	1,000	1,700	27	88	Solid	34x2	34x2	3	4.1x4.0		2 Cycle	Sep'rt			Air	
Hatfield, K	Opt	Opt	Opt	Opt	Opt	Opt	Opt	3	4.1x4.0		2 Cycle	Sep'rt			Air	
Hercules, E	2,000	2,800	43	110	Solid	36x3½	36x3½	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Hewitt	2,000							4	4.3x6.0	28.9						
Hupmobile, HT	800	1,430		106	Pneu	32x3½	33x4	4	3.3x5.5	16.9	L Head	Block	Left	Chain	Thermo	
Ideal, I	1,500	2,800		109	Solid	36x3	36x3½	4	3.5x4.5	19.6	L Head	Pairs	Left	Gear	Thermo	Springs
Ideal, H	2,000	3,000		115		36x3	36x4	4	3.5x4.5	19.6	L Head	Pairs	Left	Gear	Thermo	Springs
Ideal, H-2	2,000	3,500		124	Solid	36x3½	36x4	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Ideal, G	3,000	4,000		124	Solid	36x4	36x5	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	Springs
I. H. C., A††	1,000	1,997		90	Solid	38x2½	38x2	2	5.0x5.0	20.0	Straight	Sep'rt	Head	Gear	Air	
I. H. C., M††		2,047		Opt	Opt	Opt	Opt	2	4.5x5.0	16.2	Straight	Sep'rt	Head	Gear	Pump	Springs
Indiana, A	3,000	3,320		135	Solid	34x3½	34x4	4	4.0x4.0	25.6		Sep'rt	Right	Gear	Pump	
Indiana, 2 ton	4,000	4,500		144	Solid*	36x4	36x3½	4	4.1x5.3	27.3		Sep'rt	Right	Gear	Pump	
Indiana, 3 ton	6,000	6,000		160	Solid*	36x4½	40x4	4	4.8x5.0	36.1		Sep'rt	Right	Gear	Pump	
Jarvis, 2 ton	4,000	3,700		120	Solid*	36x4	36x3½	4	4.0x6.0	25.6	Straight	Sep'rt	Head	Chain	Pump	Springs
Jarvis, 3½ ton	7,000	5,800		128	Solid*	36x5	36x4	4	4.0x6.0	25.6	Straight	Sep'rt	Head	Chain	Pump	Springs
Jarvis, 5 ton	10,000	7,500		144	Solid*	36x6	38x5	4	4.0x6.0	25.6	Straight	Sep'rt	Head	Chain	Pump	Springs
Johnson, A		2,000		100	Solid	34x3½	34x3½	4	4.3x4.5	28.9	L Head	Pairs	Left		Pump	
Johnson, B		4,000		108	Solid	36x4	36x4	4	4.5x5.3	32.4	L Head	Pairs	Side		Pump	
Johnson, C		8,000		132	Solid*	36x5	36x3½	4	5.0x5.5	40.0	L Head	Pairs	Side		Pump	
Kadix, C	6,000	5,800		148	Solid*	37x5	41x4	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Kadix, C	6,000	5,900		166	Solid*	37x5	41x4	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Kadix, D	8,000	6,200		148	Solid*	37x5	41x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Kadix, D	8,000	6,300		166	Solid*	37x5	41x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Kadix, E	10,000			148	Solid*	42x6	42x6	4	5.0x5.8	40.0	L Head	Pairs	Left	Gear	Pump	Springs
Kadix, E	10,000			166	Solid*	42x6	42x6	4	5.0x5.8	40.0	L Head	Pairs	Left	Gear	Pump	Springs
Kato, H		6,000		120	Solid	34x5	34x5	4	4.8x5.0	36.1	L Head	Pairs	Side		Pump	
Kearns, A	1,500	1,400		100	Solid	34x2	34x2	3	4.0x4.0		2 Cycle	Sep'rt	2 Cycle		Air	
Kelly, K-30	3,000	3,400		120	Solid	36x3½	36x4	4	3.8x5.3	22.5	L Head	Block	Right	Gear	Pump	Springs
Kelly, K-40	7,000			150	Solid	38x5	42x5	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
King, 3	7,000	5,950		120	Solid*	36x6	36x4	4	4.5x5.5	32.4	L Head	Pairs	Left	Spi'l	Pump	Springs
Kisselkar	1,500	2,500	22	120	Opt	Opt	Opt	4	4.3x4.3	28.9	L Head	Pairs	Left	Chain	Pump	
Kisselkar	2,000	3,000	24	132	Opt	Opt	Opt	4	4.5x5.3	32.4	L Head	Pairs	Left	Chain	Pump	
Kisselkar	4,000	4,500	25	140	Solid*	36x4	36x3½	4	4.5x5.3	32.4	L Head	Pairs	Left	Chain	Pump	
Kisselkar	6,000	5,300	25	144	Solid*	36x4	36x4	4	4.9x5.0	38.0	L Head	Pairs	Left	Chain	Pump	
Kisselkar	8,000	5,700	26	156	Solid*	37x5	37x5	4	4.9x5.0	38.0	L Head	Pairs	Left	Chain	Pump	
Kisselkar	10,000	6,000	26	156	Solid*	37x5	37x6	4	4.9x5.0	38.0	L Head	Pairs	Left	Chain	Pump	
Klinekar, 2-16††		1,250		86	Solid	36x3	36x3	2							Thermo	
Knickerbocker, 3	6,000			118	Opt	Opt	Opt	4	4.5x5.0	32.4	L Head	Sep'rt	Left	Gear	Pump	Springs
Knickerbocker, 3	6,000			148	Opt	Opt	Opt	4	4.5x5.0	32.4	L Head	Sep'rt	Left	Gear	Pump	Springs
Knickerbocker, 5	10,000			130	Opt	Opt	Opt	4	4.8x5.0	36.1	L Head	Sep'rt	Left	Gear	Pump	Springs
Knickerbocker, 5	10,000			148	Opt	Opt	Opt	4	4.8x5.0	36.1	L Head	Sep'rt	Left	Gear	Pump	Springs
Knox, R 3	4,000	4,800		145	Opt	Opt	Opt	4	5.0x5.5	40.0	Straight	Sep'rt	Head	Gear	Pump	Springs
Knox, R 15	6,000	7,500		149	Solid*	36x5	36x5	4	5.0x4.8	40.0	Straight	Sep'rt	Head	Gear	Pump	Springs
Koehler††	1,600	2,000	40	86	Solid	34x2	34x2	2	5.3x4.0	22.0	L Head	Sep'rt	Side	Gear	Thermo	Springs
Kopp, H	3,000			120	Solid	36x4	36x5	4	4.3x4.5	28.9	T Head	Pairs	Opp		Pump	
Kopp, L	6,000			116	Solid	36x5	36x4	4	4.9x5.5	38.0	T Head	Pairs	Opp		Pump	
Kopp, M	10,000			126	Solid	36x6	36x5	4	5.3x6.0	44.1	T Head	Sep'rt	Opp		Pump	
Krebs, A	1,500	2,300	20	100	Solid	34x3	34x3	2	4.5x5.0		2 Cycle	Block			Thermo	
Krebs, B	1,500	2,300	20	100	Solid	34x3	34x3	2	4.5x5.0		2 Cycle	Block			Thermo	

†Three wheels. ††Two-cylinder opposed. *Drives on four wheels. †††Gas-electric power plant.

ABBREVIATIONS:—Tires: Solid*, solid dual tires in rear. **Cylinders:** Sep'rt, separate. **Valves:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling:** Thermo, thermo-syphon. **Radiator Suspension:** S & T, springs and trunnions. **Ignition:** Sing, single; Doub, double; Gov, governor; Auto, automatic. **Magneto or Generator:** Atw K, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Lubrication:** Spl-Pres, splash and pressure; In Fuel, oil fed with gasoline. **Bore and Stroke:** In decimals to nearest 1-10 inch, as 4.3=4¼ etc., .2=$\frac{3}{16}$, .1=⅛, .3=¼, .4=⅜, .5=½, .6=$\frac{9}{16}$, .7=$\frac{11}{16}$, .8=¾, .9=⅞.

Load Capacity and Complete Specifications

3

Ignition: System	Ignition: Magneto or Generator	Ignition: Control	Carburetor	Motor Lubrication	Transmission: Clutch Type	Gearset: Type	Gearset: Location	Gearset: No. Forw'd Speeds	Gear Ratio	Final Drive	Running Gear: Springs: Front	Springs: Rear	Control: Steering Wheel	Control: Gearshift	Control: Emergency Brake	Bearings: Gearset	Bearings: Rear Axle
Dual	Remy	Hand	Schebler	Spl-Pres	Disk	Sel	Unit M	3		Bevel	½ Ell	Ell	Right	Right	Right	Plain	B & R
Sing		Hand		Spl-Pres	Cone	Sel.	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Sing		Hand		Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Sing		Hand		Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Sing		Hand		Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Doub		Hand		Splash	Disk	Pro	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Doub		Hand		Splash	Disk	Pro	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Doub		Hand		Splash	Disk	Pro	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Doub		Hand		Splash	Disk	Pro	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand		Spl-Pres	Disk	Sel	Amid	3	6.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand		Spl-Pres	Disk	Sel	Amid	3	7.5-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand		Spl-Pres	Disk	Sel	Amid	4	7.7-1	Chain	½ Ell	½ El	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand		Spl-Pres	Disk	Sel	Amid	4	9.6-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Opt	Opt	Hand	Schebler	Spl-Pres	Disk	I. C.	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Opt	Opt	Hand	Schebler	Spl-Pres	Disk	I. C.	Amid	4		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Remy	Hand	Stromberg		Cone	Sel	Amid	3		Bevel	½ Ell	¾ Ell	Right	Right	Right		
Sing		Hand	Breeze	Pressure	Disk	Plan	Amid	2		Chain	Ell	Ell	Right	Pedal		Plain	Roll
Sing		Hand	Breeze	Pressure	Disk	Plan	Amid	2		Chain	Ell	Ell	Right	Pedal		Plain	Roll
Dual		Hand		Splash	Disk	Plan	Unit M	2		Chain	Ell	Ell	Right	Right	Pedal		
Dual		Hand		Splash	Disk	Plan	Unit M	2		Chain	Ell	Ell	Right	Right	Pedal		
Dual		Hand		Splash	Cone	Sel	Unit J	3		Chain	Ell	Ell	Right	Right	Right		
Dual		Hand		Splash	Cone	Sel.	Unit J	3		Chain	½ Ell	Plat	Right	Right	Right		
Dual		Hand		Splash	Disk	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right		
Dual		Hand		Splash	Disk	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right		
Dual		Hand		Splash	Disk	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right		
Sing	Bosch	Hand		In Fuel		Fric				Chain			Left		Left		Roll
Sing	Bosch	Fixed		In Fuel		Fric				Chain			Left		Left		Roll
Sing	Bosch	Fixed	Schebler		Cone	Sel	Amid	3	8.2-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	B & R
	Bosch					Plan		2		Chain						Roll	Roll
Sing	Bosch	Hand	Zenith	Splash	Disk	Sel	Unit M	3	3.8-1	Bevel	½ Ell	Cross	Right	Center	Center	B & R	B & R
Sing	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Unit J	3		Chain	¾ Ell	¾ Plat	Right	Right	Right	Ball	Ball
Sing	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Unit J	3		Chain	¾ Ell	¾ Plat	Right	Right	Right	Ball	Ball
Sing	Eisemann	Hand	Stromberg	Spl-Pres	Cone	Sel	Unit J	3	9.6-1	Chain	¾ Ell	¾ Plat	Right	Right	Right	Ball	Ball
Dual	Eisemann	Hand	Stromberg	Spl-Pres	Cone	Sel	Unit J	3	11.0-1	Chain	½ Ell	Plat	Right	Right	Right	Ball	Ball
Triple	Heinze	Hand	Schebler	Spl-Pres	Con Bd.	I. C.	Amid	2		Chain	Ell	Ell	Right	Right	Right	Plain	Roll
Triple	Heinze	Hand	Schebler	Spl-Pres	Con Bd.	I. C.	Amid	2		Chain	Ell	Ell	Right	Right	Right	Plain	Roll
Dual	Bosch	Fixed		Splash	Disk	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Left		Roll	Roll
Dual	Bosch	Fixed		Splash	Disk	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Left		Roll	Roll
Dual	Bosch			Splash	Disk	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Left		Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Gov	Stromberg	Pressure	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell				Ball	Plain
Dual	Bosch	Gov	Stromberg	Pressure	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell				Ball	Plain
Dual	Bosch	Gov	Stromberg	Pressure	Opp	Sel	Amid	3		Chain	½ Ell	½ Ell				Ball	Plain
Sing	Mea	Fixed	Stromberg	Spl-Pres	Disk	Sel	Amid	3	9.4-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Sing	Mea	Fixed	Stromberg	Spl-Pres	Disk	Sel	Amid	3	9.4-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Sing	Mea	Fixed	Stromberg	Spl-Pres	Disk	Sel	Amid	3	9.4-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Sing	Mea	Fixed	Stromberg	Spl-Pres	Disk	Sel	Amid	3	9.4-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Sing	Mea	Fixed	Stromberg	Spl-Pres	Disk	Sel	Amid	4	9.4-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Sing	Mea	Fixed	Stromberg	Spl-Pres	Disk	Sel	Amid	4	9.4-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Sing	Remy	Hand	Schebler	Splash	Cone	Sel	Amid	3		Bevel	½ Ell	Plat				Roll	B & R
Opt	Opt	Hand	Schebler			Frict				Chain	Ell	Ell	Right		Pedal		Ball
Sing		Gov	Breeze	Pressure	Cone	Sel	Amid	3	8.6-1	Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Sing		Gov	Breeze	Pressure	Cone	Sel	Amid	3	14.0-1	Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Dual	Bosch	Fixed	Schebler	Splash	Disk	I. C.	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual		Hand	Stromberg	Splash	Cone	Sel	Amid	3		Bevel	½ Ell	½ Ell	Right	Right	Right	Ball	Ball
Dual		Hand	Stromberg	Splash	Cone	Sel	Amid	4		Bevel	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual		Hand	Stromberg	Splash	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual		Hand	Stromberg	Splash	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual		Hand	Stromberg	Splash	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual		Hand	Stromberg	Splash	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell	Right	Rigth	Right	Ball	Roll
				Pressure		Plan		2		Chain	½ Ell	Ell					
Dual	Bosch	Hand	Stromberg	Splash	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Left	Left	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Left	Left	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Left	Left	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Left	Left	Roll	Roll
Doub	Bosch	Hand	Stromberg	Pressure	Disk	Sel	Unit M	3	5.4-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Doub	Bosch	Hand	Stromberg	Pressure	Disk	Sel	Unit M	3	7.1-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Sing	Bosch	Fixed	Schebler	Pressure	Cone	Plan	Amid	2	4.0-1	Chain	½ Ell	Ell	Left	Pedal	Center	Plain	Plain
Doub	Bosch	Hand	Optional	Pressure	Disk	I. C	Amid	3		Chain	Ell	Ell				Ball	Roll
Doub	Bosch	Hand	Schebler	Pressure	Opt	Sel.	Amid	3		Chain						Roll	Roll
Doub	Bosch	Hand	Schebler	Pressure	Opt	Sel	Amid	3		Chain						Roll	Roll
Sing	Bosch	Gov	Stromberg	Splash	Cone	Sel	Amid	3	4.5-1	Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Ball
Sing	Bosch	Gov	Stromberg	Splash	Cone	Sel	Amid	3	4.5-1	Bevel	½ Ell	½ Ell	Left	Center	Center	Roll	Ball

ABBREVIATIONS:—Clutch: Exp B, expanding band; Con B, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; I. C., individual clutches. **Gearset Location:** Amid. amidships; Unit M, unit with the motor; Unit J, unit with the jackshaft; Unit X, unit with the rear axle. **Drive:** Bevel, shaft with bevel gears at rear axle; Worm, shaft with worm gears at rear axle; Ext G, external gear; Int G, internal gear. **Springs:** ½ Ell, semi-elliptic; Ell, ellipitc; ¾ Ell, ¾ elliptic; Plat, platform. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller, B R & P, ball roller and plain.

Motor Truck Chassis on the 1913 Market

4

NAME AND MODEL	Load Capacity Pounds	Chassis Weight Pounds	Turning Radius Feet	Wheelbase	TIRES Kind	TIRES Front	TIRES Rear	No. Cylinders	Bore and Stroke	S. A. E. H. P.	CYLINDERS Shape	CYLINDERS How Cast	Valve Location	Camshaft Drive	COOLING Circulation	COOLING Radiator Suspension
LaFrance, 6 ton	12,500	9,000	22½	143	Solid*	36x5	38x6	4	5.5x6.0	48.4	T Head	Pairs	Right	Gear	Pump	Springs
Lambert	1,500			114	Solid	33x4	33x4	4	3.5x4.3	19.6	L Head	Pairs	Right	Gear	Pump	
Lambert, 1 ton	2,000	3,200		114	Solid	36x3	36x3½	4	4.1x4.5	27.3	L Head	Block	Right	Gear	Pump	Springs
Lambert, 2 ton	4,000				Solid	36x3½	36x4	4	4.1x4.5	27.3	L Head	Block	Right	Gear	Pump	Springs
Lange, C	2,000	4,100		125	Solid	36x3½	38x4	4	3.8x5.3	22.5	L Head	Block	Left	Hel'l	Thermo	Springs
Lange, D	3,000	4,400		125	Solid*	36x3½	38x5	4	4.1x5.3	27.3	L Head	Block	Left	Hel'l	Thermo	Springs
Lange, B	4,000	4,800		136	Solid	36x4	38x3	4	4.1x5.3	27.3	L Head	Block	Left	Hel'l	Thermo	Springs
Lauth-Juergens, K	2,000			Opt	Opt	Opt	Opt	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Lauth-Juergens, L	4,000			Opt	Opt	Opt	Opt	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Lauth-Juergens, M	6,000			Opt	Opt	Opt	Opt	4	4.8x5.0	36.1	L Head	Sep'rt	Left	Gear	Pump	Springs
Lewis, 2I	5,000	5,200	30	144	Solid	34x4	36x3½	4	4.3x5.0	28.9	T Head	Pairs	Opp	Gear	Pump	Springs
Lewis, 5I	10,000	7,600	30	144	Solid*	36x6	38x6	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	Springs
Lewis, 5IL	10,000	7,600	30	168	Solid*	36x6	38x6	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	Springs
Lincoln, 27 & 23††	800			87	Pneu	34x3½	34x3½	2	4.1x4.0	13.6	L Head	Sep'rt	Side	Gear	Air	
Lippard-Stewart	1,500	2,500	17	115	Solid	35x4½	35x4½	4	3.8x5.3	22.5	L Head	Block	Left	Hel'l	Pump	Springs
Little Giant, D	2,000	2,100	16	91	Solid	34x2	34x2½	2	5.0x4.0	20.0	L Head	Sep'rt	Head	Gear	Thermo	
Locomobile, A	10,000			Opt	Opt	Opt	Opt	4	5.0x6.0	40.0	T Head	Pairs	Opp	Gear	Pump	Rubber
Longest, 3A	8,000			144	Solid*	36x5	36x5	4	5.0x5.5	40.0	T Head	Pairs	Opp	Gear	Pump	Springs
Longest, 3A	8,000			172	Solid*	36x5	36x5	4	5.0x5.5	40.0	T Head	Pairs	Opp	Gear	Pump	Springs
Lord Baltimore, C	2,000	3,800		130	Solid	34x4	36x4	4	3.8x5.0	22.5	L Head	Block	Left	Gear	Pump	
Lord Baltimore, B	4,000	4,200		135	Solid*	34x4	36x3	4	3.8x5.0	22.5	L Head	Block	Left	Gear	Pump	
Lord Baltimore, A	6,000	7,000		130	Solid*	34x4	38x4	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Lord Baltimore, E	8,000	7,800		135	Solid*	36x5	42x5	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Lord Baltimore, F	10,000	8,400		140	Solid*	36x6	42x6	4	5.3x7.0	44.1	T Head	Pairs	Opp	Gear	Pump	
Luck Utility	1,000			115	Solid			4	3.3x4.0	16.9	L Head	Block	Right	Gear	Thermo	
Mack, 1 ton	2,000			Opt	Solid*			4	4.5x5.5	32.4	L Head	Pairs	Right		Pump	
Mack, 1½ ton	3,000			Opt	Solid*			4	4.5x5.5	32.4	L Head	Pairs	Right		Pump	
Mack, 2 ton	4,000			Opt	Solid*			4	4.5x5.5	32.4	L Head	Pairs	Right		Pump	
Mack, 3 ton	6,000			Opt	Solid*			4	5.5x6.0	48.4	L Head	Pairs	Right		Pump	
Mack, 4 ton	8,000			Opt	Solid*			4	5.5x6.0	48.4	L Head	Pairs	Right		Pump	
Mack, 5 ton	10,000			Opt	Solid*			4	5.5x6.0	48.4	L Head	Pairs	Right		Pump	
Mack, 7 ton	14,000			Opt	Solid*			4	5.5x6.0	48.4	L Head	Pairs	Right		Pump	
Mais, 1½ ton	3,000		19	119	Solid	36x3½	36x5	4	4.0x5.3	25.6	T Head	Pairs	Opp	Gear	Pump	Springs
Mais, 2 ton	4,000		21	132	Solid*	36x3½	36x3½	4	4.0x5.3	25.6	T Head	Pairs	Opp	Gear	Pump	Springs
Mais, 3 ton	6,000		23	160	Solid*	36x4	36x4	4	4.0x5.3	25.6	T Head	Pairs	Opp	Gear	Pump	Springs
Marmon, Delivery	1,500	2,350	40	120	Solid	32x4	32x4	4	4.0x5.0	25.6	T Head	Pairs	Opp	Hel'l	Pump	Trunnions
Mason, 12††	1,000	1,500	20	96	Solid	32x3½	32x3½	2	5.0x5.0	20.0	Straight	Sep'rt	Head	Gear	Pump	
Mason, 12††	1,200	1,500	20	96	Solid	32x3½	32x3½	2	5.0x5.0	20.0	Straight	Sep'rt	Head	Gear	Pump	
Mason, 10-13††	1,600	1,500	20	96	Solid	33x4	33x4	2	5.0x5.0	20.0	Straight	Sep'rt	Head	Gear	Pump	
McIntyre, E	1,500	2,800	20	118	Solid	34x3	34x3½	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Thermo	Springs
McIntyre, A	3,000	3,600	34	144	Solid*	34x3½	36x3½	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Thermo	Springs
McIntyre, A	3,000	3,600	34	120	Solid*	34x3½	34x3½	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Thermo	Springs
McIntyre, G	6,000	5,000	28	144	Solid*	36x4	36x4	4	4.1x5.3	27.3	L Head	Block	Left	Spr'l	Thermo	Springs
McIntyre, G	6,000	5,000	28	168	Solid*	36x4	36x4	4	4.1x5.3	27.3	L Head	Block	Left	Spr'l	Thermo	Springs
Menominee, A	1,500	2,500	20	112	Solid	32x3	32x3	4	3.8x4.5	22.5	L Head	Pairs	Left	Gear	Pump	
Menominee, B	2,000	2,850	22	122	Solid	34x3	34x3	4	4.0x4.5	25.6	L Head	Pairs	Left	Gear	Pump	
Mercury, P††	1,000	1,400		85	Solid	38x2½	40x2½	2	4.3x4.0	14.5	L Head	Sep'rt	Head	Gear	Air	
Modern, B., Bx	1,000	2,200	36	114	Opt	Opt	Opt	4	3.8x4.5	22.5	L Head	Block	Right	Gear	Thermo	Spring
Modern, BR	1,000	2,200	36	114	Opt	Opt	Opt	4	3.8x4.5	22.5	L Head	Block	Right	Gear	Thermo	Spring
Modern, A, AX	1,500	2,280	47	120	Solid	36x3	36x3½	4	4.3x5.3	30.3	L Head	Block	Right	Gear	Pump	Spring
Mogul, G	4,000	4,600		120	Solid	36x4	36x5	4	4.1x5.3	27.3	L Head	Block	Right	Gear	Pump	Spring
Mogul, O	8,000	4,600		142	Solid	36x6	40x6	4	5.0x5.8	40.0	T Head	Pairs	Opp	Gear	Pump	Spring
Mogul, M	10,000	10,000		154	Solid	36x6	40x6	4	5.3x5.8	44.1	T Head	Pairs	Opp	Gear	Pump	Spring
Mogul, V	10,000	11,000		188	Solid	36x7	40x6	4	5.3x5.8	44.1	T Head	Pairs	Opp	Gear	Pump	Spring
Monitor, D	2,000	2,850		100	Solid	34x3½	34x3½	4	3.8x5.0	22.5	L Head	Pairs	Left	Gear	Thermo	Sprin
Monitor, C††	2,000	2,850	40	100	Solid	34x3½	34x3½	2	5.3x4.8	22.0	L Head	Sep'rt		Gear	Thermo	Rubb
Monitor, E	3,000	4,000		110	Solid	36x37	40x3½	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Sprin
Moore, C	1,500	1,800		102	Solid	36x2½	36x3	3	4.0x4.0		2 Cycle	Sep'rt			Air	
Mora, 20††	1,500	2,140	32	94	Solid	36x2	36x2½	2	4.5x4.5	16.2	L Head	Sep'rt		Gear	Thermo	
Moreland, B	2,000			Opt	Opt	Opt	Opt	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Sprin
Moreland, E	4,000			Opt	Opt	Opt	Opt	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	Sprin
Moreland, 13F	6,000			Opt	Opt	Opt	Opt	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Sprin
Motorette, LJ†	400	670	20	72	Pneu	28x3	29x3½	2	3.8x3.8	11.3	L Head	Sep'rt	Side	Gear	Thermo	
Motorette, NI†	500			72	Pneu	28x3	29x3½	2	3.8x3.8	11.3	L Head	Sep'rt	Side	Gear	Thermo	
Natco, 15		2,700	34	104	Solid	36x3½	36x3½	4	3.5x5.0	19.6	L Head	Block	Right	Gear	Thermo	Spring
Nelson-LeMoon, D1	2,000	3,200		Opt	Solid *	36x3	36x4	4	3.8x5.3	22.5	L Head	Block	Right	Gear	Pump	Spring
Nelson-LeMoon, D2	4,000	4,500		Opt	Solid *	36x4	36x4	4	4.1x5.3	27.3	L Head	Block	Right	Gear	Pump	Spring
Nelson-LeMoon, D3	6,000	6,500		Opt	Solid *	36x5	36x5	4	4.5x5.5	32.4	L Head		Right	Gear	Pump	Spring
Nyberg	3,000	3,000		Opt	Opt	Opt	Opt	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Spring
Old Reliable, 2	6,000	4,500		120	Solid	34x4	Opt	4	4.3x5.0	28.9	T Head	Pairs	Opp	Hel'l	Pump	S & T
Old Reliable, B	10,000	7,300		126	Solid*	36x6	36x6	4	4.8x5.5	36.1	T Head	Pairs	Opp	Hel'l	Pump	S & T

†Three wheels. ††Two-cylinder opposed. *Drives on four wheels. †††Gas-electric power plant.

ABBREVIATIONS:—Tires: Solid*, solid dual tires in rear. **Cylinders:** Sep'rt, separate. **Valves:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling:** Thermo, thermo-syphon. **Radiator Suspension:** S & T, springs and trunnions. **Ignition:** Sing, single; Doub, double; Gov, governor; Auto, automatic. **Magneto or Generator:** Atw K, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Lubrication:** Spl-Pres, splash and pressure; In Fuel, oil fed with gasoline. **Bore and Stroke:** In decimals to nearest 1-10 inch, as 4.3=4¼ etc., .2=$\frac{3}{16}$, .1=$\frac{1}{8}$, .3=$\frac{1}{4}$, .4=$\frac{3}{8}$, .5=$\frac{1}{2}$, .6=$\frac{9}{16}$, .7=$\frac{11}{16}$, .8=$\frac{3}{4}$, .9=$\frac{7}{8}$.

Load Capacity and Complete Specifications

IGNITION			Carbureter	Motor Lubrication	TRANSMISSSION						RUNNING GEAR					BEARINGS	
						GEARSET					SPRINGS		CONTROL				
System	Magneto or Generator	Control			Clutch Type	Type	Location	No. Forw'd Speeds	Gear Ratio	Final Drive	Front	Rear	Steering Wheel	Gearshift	Emergency Brake	Gearset	Rear Axle
Dual	Bosch	Hand	Schebler	Spl-Pres		Fric				Chain	½ Ell	½ Ell	Right		Right		Roll
Dual	Bosch	Hand	Schebler	Spl-Pres		Fric				Chain	½ Ell	½ Ell	Right	Right	Right		Ball
Dual	Remy	Hand	Schebler	Spl-Pres		Fric	Unit M			Chain	½ Ell	½ Ell	Right	Right	Right		Roll
Dual	Remy	Hand	Schebler	Spl-Pres		Fric	Amid			Chain	½ Ell	½ Ell	Right	Right	Right		Roll
Doub	Bosch	Hand	Stromberg	Spl-Pres	Disk	I. C.	Amid	3		Roller	½ Ell	½ Ell	Left	Center	Center	R & R	Roll
Doub	Bosch	Hand	Stromberg	Spl-Pres	Disk	I. C.	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center	B & R	Roll
Doub	Bosch	Hand	Stromberg	Spl-Pres	Disk	I. C.	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center	B & R	Roll
Doub	Opt	Hand	Stromberg	Splash	Disk	Sel	Amid	4	7.2-1	Chain	½ Ell	½ Ell	Right			Ball	Ball
Doub		Hand	Stromberg	Splash	Disk	Sel	Amid	4	5.6-1	Chain	½ Ell	½ Ell	Left			Ball	Ball
Doub		Hand	Stromberg	Splash	Disk	Sel	Amid.	4	7.2-1	Chain	½ Ell	½ Ell	Right			Plain	Ball
Dual	Bosch	Hand	Rayfield	Pressure	Disk	Sel	Amid	3	8.5-1	Chain	½ Ell	Plat	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Rayfield	Pressure	Disk	Sel.	Amid	3	9.7-1	Chain	½ Ell	Plat	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Rayfield	Pressure	Disk	Sel	Amid	3	9.7-1	Chain	½ Ell	Plat	Right	Right	Right	Ball	Roll
Sing	K. W.		Schebler	Splash		Fric				Chain	Ell	Ell	Left	Left			Roll
Sing	Eisemann	Auto	Rayfield	Splash	Cone	Sel	Amid	3		Bevel	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Dual	Spld'rf	Hand	Schebler	Pressure	Disk	Plan	Amid	2	8.5-1	Chain	¾ Ell	Ell	Right	Right	Right	B & R	Ball
Dual		Fixed	Own	Pressure	Disk	Sel	Amid		10.3-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	Schebler	Pressure	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
Dual	Bosch	Hand	Schebler	Pressure	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
Sing	Bosch	Hand	Schebler	Splash	Cone	Sel	Unit M	3		Int G	½ Ell	½ Ell	Left	Center	Center	Ball	Ball
Sing	Bosch	Hand	Schebler	Splash	Cone	Sel	Unit M	3		Int G	½ Ell	½ Ell	Left	Center	Center	Ball	Ball
Dual	Eisemann	Gov	Holley	Pressure	Cone	Sel	Amid	3	8.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Ball
Dual	Eisemann	Auto	Holley	Pressure	Cone	Sel	Amid	3	9.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Ball
Dual	Eisemann	Auto	Holley	Pressure	Cone	Sel	Amid	3	9.8-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Ball
Dual	Opt	Hand	Opt	Spl-Pres		Plan		2		Bevel	½ Ell	¾ Ell	Right	Pedal	Pedal	B & R	Ball
Dual		Gov	Stromberg	Pressure	Disk	Sel		3		Chain	½ Ell	Plat				Ball	Roll
Dual		Gov	Stromberg	Pressure	Disk	Sel		3		Chain	½ Ell	Plat				Ball	Roll
Dual		Gov	Stromberg	Pressure	Disk	Sel		3		Chain	½ Ell	Plat				Ball	Roll
Opt	Bosch	Gov	Opt	Pressure	Cone	Sel		3		Chain	½ Ell	Plat				Ball	Roll
Opt	Bosch	Gov	Opt	Pressure	Cone	Sel		3		Chain	½ Ell	Plat				Ball	Roll
Opt	Bosch	Gov	Opt	Pressure	Cone	Sel		3		Chain	½ Ell	Plat				Ball	Roll
Opt	Bosch	Gov	Opt	Pressure	Cone	Sel		3		Chain	½ Ell	Plat				Ball	Roll
Sing	Eisemann	Auto	Rayfield	Splash	Exp Bd	Pro	Unit M	3	7.8-1	Int G	½ Ell	½ Ell	Left	Left	Left	Ball	Roll
Sing	Eisemann	Auto	Rayfield	Splash	Exp Bd	Pro	Unit M	3	7.8-1	Int G	½ Ell	½ Ell	Left	Left	Left	Ball	Roll
Sing	Eisemann	Auto	Rayfield	Spalsh	Exp Bd	Pro	Unit M	3	7.8-1	Int G	½ Ell	½ Ell	Left	Left	Left	Ball	Roll
Dual	Bosch	Hand	Stromberg	Pressure	Cone	Sel	Unit X	3		Bevel	½ Ell	Ell	Right	Right	Right	Ball	Ball
Dual	Spld'rf	Hand	Schebler	Spl-Pres	Cone	Plan	Unit M	2		Chain	½ Ell	Ell	Right	Pedal	Right	Plain	Roll
Dual	Spld'rf	Hand	Schebler	Spl-Pres	Cone	Plan	Unit M	2		Chain	½ Ell	Ell	Right	Pedal	Right	Plain	Roll
Dual	Spld'rf	Hand	Schebler	Spl-Pres	Cone	Plan	Unit M	2		Chain	½ Ell	Ell	Right	Pedal	Pedal	Plain	Roll
Dual		Hand	Schebler	Splash	Cone	Sel	Amid	3	6.4-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Ball
Dual		Hand	Stromberg	Splash.	Disk	Sel	Unit M	3	8.1-1	Chain	½ Ell	½ Ell	Right	Center	Center	Ball	Ball
Dual		Hand	Stromberg	Splash.	Disk	Sel	Unit M	3	8.1-1	Chain	½ Ell	½ Ell	Right	Center	Center	Ball	Ball
Dual		Hand	Stromberg	Splash	Disk	Sel	Unit M	3	4.0-1	Chain	½ Ell	½ Ell	Right	Center	Center	Ball	Roll
Dual		Hand	Stromberg	Splash.	Disk	Sel	Unit M	3	4.0-1	Chain	½ Ell	½ Ell	Right	Center	Center	Ball	Roll
Dual		Hand	Schebler	Pressure	Disk	Sel	Unit M	3		Bevel	½ Ell	Plat	Right	Center	Center	Ball	B & R
Dual		Hand	Schebler	Pressure	Disk	Sel	Unit M	3		Bevel	½ Ell	Plat	Right	Center	Center	Ball	Ball
Sing	Remy	Fixed	Own	Spl-Pres	Disk	Plan	Unit M	2		Chain	Ell	Ell	Right	Right	Right		Roll
Sing	Opt	Hand	Opt	Splash.	Cone	Sel	Unit J	3	6.5-1	Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Roll
Sing	Opt	Hand	Opt	Splash.	Cone	Sel	Unit J.	3	6.5-1	Bevel	½ Ell	½ Ell	Left	Center	Center	Ball	Roll
Sing	Opt	Hand	Opt	Splash.	Cone	Sel	Unit J	3	6.5-1	Chain	½ Ell	½ Ell		Center	Center	Ball	Roll
Sing	Mea	Hand	Stromberg	Splash	Disk	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Doub	Mea		Stromberg	Splash	Disk	Pro	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Doub	Mea	Hand	Stromberg	Splash	Disk	Pro	Unit J	3		Chain	½ Ell	½ Ell	Right			Ball	Roll
Doub	Mea	Hand	Stromberg	Splash	Disk	Pro	Unit J	3		Chain	½ Ell	½ Ell	Right			Ball	Roll
Sing	Bosch	Hand	Stromberg	Spl-Pres	Disk	Sel	Unit M	3		Bevel	½ Ell	Ell	Right	Center	Center	Ball	B & R
Doub	Bosch	Hand	Schebler	Spl-Pres	Cone	Sel	Amid	3		Bevel	½ Ell	Ell	Right	Right	Right	Roll	B & R
Sing	Bosch	Hand	Schebler	Spl-Pres	Cone	Sel	Unit J	3	8.2-1	Chain	½ Ell	Plat	Right	Right	Right	Ball	Ball
Sing	Bosch	Fixed	Own	In-Fuel	Disk	Plan	Amid	2	5.5-1	Chain	½ Ell	½ Ell	Right	Center	Center	Roll	Roll
Sing		Fixed		Spl-Pres	Disk	Plan	Amid.	2	6.8-1	Chain	½ Ell	½ Ell	Right	Right		Roll	Roll
Dual	Remy	Hand	Schebler	Spl-Pres	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell	Left	Pedal	Pedal	Plain	Ball
Dual	Remy	Hand	Schebler	Spl-Pres	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Remy	Hand	Schebler	Spl-Pres	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Sing	Bosch	Fixed	Holley	Splash	Cone	Plan	Unit M	2	9.0-1	Chain	Ell	½ Ell	Right	Right	Pedal	Plain	Ball
Sing	Bosch	Fixed	Holley	Splash	Cone	Plan	Unit M	2	9.0-1	Chain	Ell	½ Ell	Right	Right	Pedal	Plain	Ball
Sing				Pressure	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell	Left	Center	Pedal	Ball	Roll
Sing		Fixed	Rayfield	Splash	Disk	Sel	Unit M	3	Opt	Chain	½ Ell	½ Ell	Right	Center	Center	Roll	Roll
Dual	Bosch	Hand	Rayfield	Splash	Disk	Sel	Unit M	3	Opt	Chain	½ Ell	½ Ell	Right	Center	Center	Roll.	Roll
Dual	Bosch	Hand	Rayfield	Splash.	Disk	Sel	Unit M	3	Opt	Chain	½ Ell	½ Ell	Right	Center	Center	Roll	Roll
Dual	Remy	Hand	Opt	Splash.	Disk	Sel	Unit M	3	9.0-1	Chain	½ Ell	½ Ell	Right	Center.	Center	Ball	Roll
	Bosch	Hand	Schebler	Pressure	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Doub	Bosch	Hand	Schebler	Pressure	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll

ABBREVIATIONS:—Clutch: Exp B, expanding band; Con B, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; I. C., individual clutches. **Gearset Location:** Amid, amidships; Unit M, unit with the motor; Unit J, unit with the jackshaft; Unit X, unit with the rear axle. **Drive:** Bevel, shaft with bevel gears at rear axle; Worm, shaft with worm gears at rear axle; Ext G, external gear; Int G, internal gear. **Springs:** ½ Ell, semi-elliptic; Ell, elliptic; ¾ Ell, ¾ elliptic; Plat, platform. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller, B R & P, ball roller and palin.

Motor Truck Chassis on the 1913 Market

5

NAME AND MODEL	Load Capacity Pounds	Chassis Weight Pounds	Turning Radius Feet	Wheelbase	TIRES Kind	TIRES Front	TIRES Rear	No. Cylinders	Bore and Stroke	S. A. E. H. P.	CYLINDERS Shape	CYLINDERS How Cast	Valve Location	Camshaft Drive	COOLING Circulation	COOLING Radiator Suspension
Oliver, A††	1,500	2,500		102	Solid	34x3	34x3½	2	5.0x5.0	20.0	L Head	Sep'rt	Top	Gear	Thermo	Springs
Oliver, B	3,000			133	Solid*	36x3½	36x3	4								
Overland, 69 T	800	1,900	19	110	Solid	33x4	33x4	4	4.0x4.3	25.6	L Head	Sep'rt	Left	Gear	Thermo	Trunnions
Packard, 2 ton	4,000			Opt	Opt	Opt	Opt	4	4.1x5.1	26.4	T Head	Pairs	Opp	Gear	Pump	Springs
Packard, 3 ton	6,000			Opt	Opt	Opt	Opt	4	4.5x5.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Packard, 5 ton	10,000			Opt	Opt	Opt	Opt	4	5.0x5.5	40.0	T Head	Pairs	Opp	Gear	Pump	Springs
Packers, D	4,000	4,300		130	Solid	36x3½	36x5	4	4.3x4.5	28.9	T Head	Pairs	Opp	Gear	Pump	
Packers, E	8,000	6,800		150	Solid*	36x5	36x5	4	5.3x6.0	44.1	T Head	Sep'rt	Opp	Gear	Pump	
Palmer	1,500			110	Solid	34x2½	34x3½	4	3.6x4.8	20.3	L Head	Pairs	Right		Pump	
Pathfinder	1,500	2,300	25	120	Solid	35x4½	35x4½	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Thermo	
Peerless, T C	6,000	6,200	25	151	Solid*	36x4	40x4	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	6,000	6,500	27	174	Solid*	36x4	40x4	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	8,000	6,900	25	151	Solid*	36x5	40x5	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	8,000	7,200	27	174	Solid*	36x5	40x5	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	10,000	7,600	25	151	Solid*	38x6	42x6	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	10,000	8,000	27	174	Solid*	38x6	42x6	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	12,000	8,200	25	151	Solid*	38x7	42x7	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	12,000	8,600	27	174	Solid*	38x7	42x7	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Pierce-Arrow	10,000			Opt	Solid	Opt	Opt	4	4.9x6.0	38.0	T Head	Pairs	Opp	Gear	Pump	Trunnions
Piggins, I ton	2,000	3,800	20	115	Solid	3½	4	4	4.3x4.8	28.9	L Head	Pairs	Left	Gear	Pump	
Plymouth, D-2	2,000	1,000		98	Solid	34x3	34x3½	4	4.0x4.3	25.6	L Head	Pairs	Right	Gear	Pump	Springs
Plymouth, G-2	4,000	1,800		126	Solid	36x5	36x6	4	4.8x5.0	36.1	L Head	Pairs	Right	Gear	Pump	Springs
Pope-Hartford	6,000		21	138½	Solid*	36x6	36x4	4			Straight	Pairs	Head	Gear	Pump	Springs
Pope-Hartford	10,000		21	140	Solid*	36x7	42x6	4			Straight	Pairs	Head	Gear	Pump	Springs
Progress, A	3,000	2,900			Solid	36x3½	36x5	4	4.1x5.3	27.3	L Head	Pairs	Left	Gear	Pump	Springs
Progress, B	6,000	5,700			Solid*	36x5	36x4	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Randolph, I ton	2,000			115	Solid			4	3.8x4.5	22.5						
Randolph, 2 ton	4,000			125	Solid	36x4	38x5	4	4.1x5.3	27.3	L Head	Pairs	Side		Pump	
Randolph, 4 ton	8,000			136	Solid*	36x6	40x5	4	4.5x5.5	32.4	L Head	Pairs	Side		Pump	
Randolph, 5 ton	10,000			140	Solid*	36x7	40x6	4	5.0x5.8	40.0	T Head	Pairs	Opp		Pump	
Randolph, R	12,000			140	Solid*	36x7	40x6	4	5.0x5.8	40.0	T Head		Opp		Pump	
Reo, H	1,500	1,700		90	Solid	36x2½	36x3	1	4.8x6.0	9.0	L Head	Sep'rt	Side	Gear	Thermo	
Reo, J	4,000	4,000		130	Solid*	36x4	36x3	4	4.0x4.5	25.6	L Head	Pairs	R & H	Gear	Pump	
Robinson, B	3,000			112	Solid	34x4	Opt	4	4.3x4.8	36.1						
Robinson, D	4,000	4,200		112	Solid*	34x4	Opt	4	4.3x4.8	36.1						
Rowe, A	1,500			120	Solid	34x4½	34x4½	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Rowe, B	2,000			138	Solid	34x3½	34x4	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Rowe, C	3,000			144	Solid	34x3½	34x5	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Rowe, D	4,000			150	Solid*	36x4	36x3½	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Rowe, E	6,000			150	Solid*	36x4	36x4	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Rowe, F	10,000			150	Solid*	36x4	38x5	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
S. & S., 1,000	1,500	2,450		136	Solid	34x4½	34x4½	4	4.1x5.3	27.3	L Head	Sep'rt	Left.	Gear	Pump	
Sampson, 3 ton	6,000	6,000		140	Solid*	34x4	36x4	4	4.5x5.5	32.4	L Head	Pairs	Right	Gear	Thermo	Springs
Sampson, 1½ ton	3,000	4,000		110	Solid	32x4	34x5	4	4.0x5.0	25.6	L Head	Pairs	Right	Gear	Thermo	Springs
Sampson, 5 ton	10,000	8,000		155	Solid*	36x6	36x6	4	5.0x5.5	40.0	L Head	Pairs	Left	Gear	Thermo	Springs
Sandusky, B	1,500	2,700	35	120	Solid	34x4	34x4½	4	3.8x5.0	22.5	L Head	Block	Right	Hel'l	Pump	Springs
Sandusky, C	3,000	3,360	35	106	Opt	Opt	Opt	4	3.8x5.0	22.5	L Head	Block	Right	Gear	Pump	Springs
Sanford, J	2,000	2,400	32	88	Solid	38x3	38x3	3	4.0x4.5		2 Cycle	Sep'rt			Air	
Sanford, K	2,000	2,700	34	106	Solid	36x3½	36x3½	4	4.0x4.5	25.6	L Head	Pairs	Left	Gear	Pump	Springs
Saurer, 5 ton	10,000			153½	Solid*	36x5	42x5	4	4.4x5.5	30.6	T Head	Pairs	Opp		Pump	
Saurer, 6½ ton	13,000			159	Solid*	36x5	42x6	4	4.4x5.5	30.6	T Head	Pairs	Opp		Pump	
Schacher, Delivery	1,800			120		34x4	34x4	4	4.3x5.5	28.9	L Head	Block	Right	Spi'l	Pump	
Schacher, I ton	2,000	4,000		138	Solid	40x3½	40x4	4	4.3x5.5	28.9	L Head	Block	Right	Spi'l	Pump	
Schacher, 18	4,000			158	Solid*	36x3½	36x3½	4	4.3x5.5	28.9	L Head	Block	Right	Spi'l	Pump	
Schacher, 19	6,000		48	144	Solid*	36x4	36x4	4	4.3x5.5	28.9	L Head	Block	Right	Spi'l	Pump	Springs
Schacher, 21	8,000		48	144	Solid*	36x5	36x5	4	4.3x5.5	28.9	L Head	Block	Right	Spi'l	Pump	Springs
Schleicher, 3 ton	6,000			Opt	Opt	Opt	Opt	4	5.0x5.5	40.0	L Head	Pairs	Left	Gear	Pump	Rubber.
Schleicher, 5 ton	10,000			Opt	Opt	Opt	Opt	4	5.5x6.0	48.4	L Head	Pairs	Left	Gear	Pump	Rubber
Schmidt, F††	1,500			90	Solid			2				Sep'rt			Air	
Schmidt, C††	2,000			92	Solid			2				Sep'rt			Air	
Seagrave, C		5,000	40	124	Solid	36x4	38x3½	4	5.8x6.0	53.0	Straight	Sep'rt	Head	Gear	Air.	
Seagrave, D2	4,000	5,500	40	136	Solid	36x4	38x3½	6	5.8x6.0	79.5	Straight	Sep'rt	Head	Gear	Air	
Seagrave, F	6,000	7,500	30	148	Solid*	36x4	38x3½	4	6.0x8.0	57.6	T Head	Sep'rt	Opp	Gear	Pump	Springs
Seagrave, G				144	Solid*	36x4	38x3½	6	5.8x6.0	79.5	Straight	Pairs	Head	Gear	Pump	Springs
Seitz	1,500			92	Solid	34x3	34x3	4	3.5x4.5	19.6	L Head	Pairs	Side		Pump	
Seitz, I ton	2,000			108	Solid	36x3½	36x3½	4	4.5x4.5	32.4	L Head	Pairs	Side		Pump	
Seitz, 2 ton	4,000			118	Solid*	36x4	36x2½	4	4.5x5.0	32.4	L Head	Pairs	Side		Pump	
Seitz, 3 ton	6,000			124	Solid*	36x5	36x3½	4	5.0x5.0	40.0	L Head	Pairs	Side		Pump	
Seitz, 5 ton	10,000			130	Solid*	36x6	40x4	4	5.5x6.5	48.4	T Head	Pairs	Opp		Pump	
Selden, J	2,000	2,900	25	125	Solid	36x3½	36x4	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	
Selden, J	2,500	2,900	25	145	Solid	36x3½	36x4	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	
Service, J	1,500	2,200	32	115	Solid	36x3	36x3	4	3.8x5.5	22.5	L Head	Block	Right	Gear	Pump	Springs
Service, K	2,000	2,300	32	115	Solid	34x3	34x3½	4	3.8x5.5	22.5	L Head	Block	Right	Gear	Pump	Springs
Service, M	3,000	2,900	38	130	Solid	34x3½	34x4	4	4.1x5.3	27.3	L Head	Block	Right	Gear	Pump	Springs
Smith, 3½ ton	7,000							4	5.0x5.8	40.0	T Head	Pairs	Opp	Spi'l	Pump	
Smith, 6 ton	1,2000							4	5.3x5.8	44.1	T Head	Pairs	Opp	Spi'l	Pump	

† Three Wheel. ††Two-cylinder opposed. *Drives on four wheels. †††Gas-electric power plant.

ABBREVIATIONS:—Tires: Solid*, solid dual tires in rear. **Cylinders:** Sep'rt, separate. **Valves:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling:** Thermo, thermo-syphon. **Radiator Suspension:** S & T, springs and trunnions. **Ignition:** Sing, single; Doub, double; Gov, governor; Auto, automatic. **Magneto or Generator:** Atw K, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Lubrication:** Spl-Pres, splash and pressure; In Fuel, oil fed with gasoline. **Bore and Stroke:** In decimals to nearest 1-10 inch, as 4.3=4¼ etc., .2=3/16, .1=1/8, .3=1/4, .4=3/8, .5=1/2, .6=9/16, .7=11/16, .8=3/4, .9=7/8.

Load Capacity and Complete Specifications

IGNITION			Carbureter	Motor Lubrication	TRANSMISSSION						RUNNING GEAR					BEARINGS 5	
					Clutch Type	GEARSET			Gear Ratio	Final Drive	SPRINGS		CONTROL				
System	Magneto or Generator	Control				Type	Location	No. Forw'd Speeds			Front	Rear	Steering Wheel	Gear-shift	Emergency Brake	Gearset	Rear Axle
Dual		Hand	Stromberg	Pressure	Disk	Plan	Unit M	2		Bevel	½ Ell	½ Ell	Left	Pedal		P & R	Roll
			Stromberg	Pressure	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Left		Roll	Roll
Dual	Remy	Hand	Schebler	Spl-Pres	Cone	Sel		3		Bevel	½ Ell	¾ Ell	Right	Center	Center	Ball	B & R
Dual	Eisemann	Auto	Own	Splash	Disk	Pro	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	B & R	Ball
Dual	Eisemann	Auto	Own	Splash	Disk	Pro	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	B & R	Ball
Dual	Eisemann	Auto	Own	Splash	Disk	Pro	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	B & R	Ball
Dual	Spld'rf	Hand	Stromberg	Spl-Pres	Disk	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Spld'rf	Hand	Stromberg	Spl-Pres	Disk	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Remy	Hand	Schebler	Splash	Disk	Sel		3		Chain	½ Ell	½ Ell	Right	Center	Center	Ball	Ball
Dual	Eisemann	Hand	Schebler	Splash	Cone	Sel	Unit M	3	4.0-1	Bevel	½ Ell	½ Ell	Right	Right	Right	Ball	Ball
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Doub	Bosch	Hand	Own	Splash	Cone	Sel	Amid	3		Worm	½ Ell	½ Ell	Right	Right	Right	Ball	B & R
Dual	Briggs	Hand	Stromberg	Splash	Cone	Sel	Amid.	3	4.0-1	Ext G.	½ Ell	Plat	Right	Right	Right	Ball	Ball
Dual	Spld'rf	Hand	Schebler	Splash		Fric	Amid			Chain	½ Ell	Plat	Left	Left	Left	Roll	Roll
Dual	Spld'rf	Hand	Schebler	Splash		Fric	Amid			Chain	½ Ell	Plat	Left	Left	Left	Roll	Roll
Dual	Eisemann	Fixed	Own	Spl-Pres	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell	Left	Center	Center	Plain	Roll
Dual	Eisemann	Fixed	Own	Spl-Pres	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell	Left	Center	Center	Plain	Roll
Dual	Optional	Hand	Stromberg	Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right		Ball	Roll
Dual	Optional	Hand	Stromberg	Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Right			Ball	Roll
											½ Ell	½ Ell	Right	Right	Right		
	Bosch	Fixed		Splash	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right		
Dual	Bosch	Fixed		Splash	Opt	Sel	Unit J	3		Chain	½ Ell	½ Ell				Ball	Ball
Dual	Bosch	Fixed		Splash	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell				Ball	
Dual	Bosch			Splash	Cone	Sel		4		Chain	½ Ell	½ Ell					
Sing		Hand	Holley	Splash	Disk	Plan	Unit M	2	Opt	Chain	½ Ell	Ell	Left	Center	Pedal	Plain	Roll
Dual	National	Hand	Holley	Splash	Disk	Sel	Amid	3	11.0-1	Chain	½ Ell	½ Ell	Left	Center	Pedal	Roll	Roll
		Hand		Spl-Pres	Disk	I. C	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
		Hand		Spl-Pres	Disk	I. C	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual		Hand		Pressure	Disk	Sel	Amid	3		Chain	½ Ell	Plat	Right	Right	Right	Plain	Roll
Dual		Hand		Pressure	Disk	Sel	Amid	3		Chain	½ Ell	Plat	Right	Right	Right	Plain	Roll
Dual		Hand		Pressure	Disk	Sel	Amid	3		Chain	½ Ell	Plat	Right	Right	Right	Plain	Roll
Dual		Hand		Pressure	Disk	Sel	Amid	3		Chain	½ Ell	Plat	Right	Right	Right	Plain	Roll
Dual		Hand		Pressure	Disk	Sel	Amid	3		Chain	½ Ell	Plat	Right	Right	Right	Plain	Roll
Dual		Hand		Pressure	Disk	Sel	Amid	3		Chain	½ Ell	Plat	Right	Right	Right	Plain	Roll
Doub	Eisemann	Fixed	Rayfield	Spl-Pres	Cone	Sel	Unit M	3	4.0-1	Bevel	½ Ell	½ Ell	Right	Center	Center	Ball	B & R
Dual		Hand	Stromberg	Spl-Pres	Disk	Sel	Unit J	3		Chain	½ Ell	½ Ell	Left	Left	Left	Ball	Roll
Dual		Hand	Stromberg	Spl-Pres	Disk	Sel	Unit J	3		Chain	½ Ell	¾ Plat	Left	Left	Left	Ball	Roll
Dual	Bosch	Hand	Stromberg	Spl-Pres	Cone	Sel	Unit J	4		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Remy	Hand	Schebler	Splash	Cone	Sel	Unit J	3	5.0-1	Chain	½ Ell	¾ Plat	Left	Center	Center	Ball	Ball
Sing		Gov	Schebler	Splash	Cone	Sel	Unit M	3		Chain	½ Ell	¾ Plat	Left	Left	Left	Ball	Roll
Sing	Bosch	Fixed	Holley	Splash	Disk	Plan	Amid	2	4.0-1	Chain	½ Ell	½ Ell	Right		Pedal		Roll
Doub	Remy	Hand	Schebler	Pressure	Disk	Sel	Unit M	3	4.1-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
	Eisemann	Hand	Own	Pressure	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell				Ball	Ball
	Eisemann	Hand	Own	Pressure	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell				Ball	Ball
Dual		Hand	Opt	Spl-Pres	Cone	Sel	Amid	3		Bevel	½ Ell	¾ Ell	Opt	Opt	Opt	Ball	B & R
Dual		Hand	Opt	Spl-Pres	Cone	Sel	Amid	3		Worm	½ Ell	½ Ell	Left	Center	Center		Ball
Doub		Hand	Opt	Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Roll
Doub		Hand	Opt	Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Roll
Doub		Hand	Opt	Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Roll
Dual	Bosch	Hand	Stromberg	Spl-Pres	Disk	Sel	Unit J	4	5.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	Stromberg	Spl-Pres	Cone	Sel	Unit J	4	6.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Sing			Schebler	Spl-Pres		Plan		2		Chain	¾ Ell	Coil	Right	Right			
Sing			Schebler	Spl-Pres		Plan		2		Chain	¾ Ell	Coil	Right	Right			
Doub	Bosch	Hand	Rayfield	Spl-Pres	Cone	Sel	Amid	3	4.4-1	Chain	½ Ell	Plat	Right	Center	Center	Ball	Roll
Doub	Bosch	Hand	Rayfield	Spl-Pres	Cone	Sel	Amid	3	4.4-1	Chain	½ Ell	Plat	Right	Center	Center	Ball	Roll
Doub	Bosch	Hand	Rayfield	Spl-Pres	Cone	Sel	Aimd	3	4.4-1	Chain	½ Ell	Plat	Right	Right	Right	Ball	Roll
Doub	Bosch	Hand	Rayfield	Spl-Pres	Cone	Sel	Amid	3	4.4-1	Chain	½ Ell	Plat	Right	Center	Center	Ball	Roll
Dual	Remy	Hand	Schebler	Pressure		Fric	Amid			Chain	½ Ell	½ Ell					Roll
Doub	Remy	Hand	Schebler	Pressure		Fric	Amid			Chain	½ Ell	½ Ell					Roll
Doub	Remy	Hand	Schebler	Pressure		Fric	Amid			Chain	½ Ell	½ Ell					Roll
Dual	Remy	Hand	Schebler	Pressure		Fric	Amid			Chain	½ Ell	½ Ell					Roll
Doub	Remy	Hand	Schebler	Pressure		Fric	Amid			Chain	½ Ell	½ Ell					Roll.
Dual	Briggs		Stromberg	Splash	Disk	Sel	Unit M	3	7.7-1	Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Dual	Briggs		Stromberg	Splash	Disk	Sel	Unit M	3	7.7-1	Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Dual	Briggs	Hand	Stromberg	Spl-Pres		Fric	Amid		6.0-1	Chain	½ Ell	½ Ell	Left	Left		B & R	Ball
Dual	Briggs	Hand	Stromberg	Spl-Pres		Fric	Amid		6.0-1	Chain	½ Ell	½ Ell	Left	Left		B & R	Roll.
Dual		Hand	Stromberg	Spl-Pres		Fric	Amid		7.3-1	Chain	½ Ell	½ Ell	Left	Left		B & R	Roll
Doub	Eisemann	Hand	Stromberg	Splash	Disk	Sel	Amid	3		Worm	½ Ell	½ Ell	Right	Right	Right	Roll	B & R
Doub	Eisemann	Hand	Stromberg	Splash	Disk	Sel	Amid	3		Worm	½ Ell	½ Ell	Right	Right	Right	Roll	B & R

ABBREVIATIONS:—Clutch: Exp B, expanding band; Con B, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; I. C., individual clutches. **Gearset Location:** Amid, amidships; Unit M, unit with the motor; Unit J, unit with the jackshaft; Unit X, unit with the rear axle. **Drive:** Bevel, shaft with bevel gears at rear axle; Worm, shaft with worm gears at rear axle; Ext G, external gear; Int G, internal gear. **Springs:** ½ Ell, semi-elliptic; Ell, ellipitc; ¾ Ell, ¾ elliptic; Plat, platform. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller, B R & P, ball roller and plain.

Motor Truck Chassis on the 1913 Market

6

NAME AND MODEL	Load Capacity Pounds	Chassis Weight Pounds	Turning Radius Feet	Wheel-base	TIRES			No. Cylinders	Bore and Stroke	S. A. E. H. P.	CYLINDERS		Valve Location	Camshaft Drive	COOLING	
					Kind	Front	Rear				Shape	How Cast			Circulation	Radiator Suspension
Speedwell, 2 ton	4,000	4,900	34	115	Solid	36x4	Opt	4	4.1x5.3	27.3	L Head	Block	Left	Gear		
Speedwell, 4 ton	8,000	6,600	35	Opt	Solid*	36x5	36x5	4	5.0x5.0	40.0	L Head	Pairs	Left	Gear		
Speedwell, 6 ton	12,000	7,200	42½	139	Solid*	36x6	36x6	4	5.0x5.0	40.0	L Head	Pairs	Left	Gear		
Standard, 3 ton	6,000	6,100		120	Solid*	36x5	36x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Hel'l	Pump	Springs
Standard, 3 ton	6,000	6,100		148	Solid*	36x5	36x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Hel'l	Pump	Springs
Standard, 3 ton	6,000	6,100		168	Solid*	36x5	36x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Hel'l	Pump	Springs
Standard, 3 ton	6,000	6,100		192	Solid*	36x5	36x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Hel'l	Pump	Springs
Stearns, 5 ton	10,000	6,500		144	Solid	34x5	38x5	4	4.8x6.0	36.1	T Head	Sep'rt	Opp	Gear	Pump	Springs
Stearns	10,000	6,500		180	Solid	34x5	38x5	4	4.8x6.0	36.1	T Head	Sep'rt	Opp	Gear	Pump	Springs
Stegeman, 1 ton	2 000	3,000		Opt	Solid	34x3	36x4	4	3.8x4.1	22.5	L Head	Block	Left	Gear	Pump	
Stegeman, 2 ton	4,000	4,200		Opt	Solid*	34x3½	36x3½	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	
Stegeman, 3 ton	6,000	5,600		Opt	Solid*	36x4	40x4	4	4.1x5.3	32.4	L Head	Block	Left	Gear	Pump	
Stegeman, 4 ton	8,000	6,000		155	Solid*	36x5	40x5	4	4.5x5.5	32.4	L Head	Block	Left	Gear	Pump	
Stegeman, 6 ton	12,000	7,000		165	Solid*	36x6	40x6	4	4.5x5.5	32.4	L Head	Block	Left	Gear	Pump	
Stegeman, 1,500	1,500	2,400		120	Solid	34x2½	34x3	4	3.8x5.3	22.5	T Head	Block	Opp	Gear	Pump	
Sternberg, 2 ton	4,000	4,000	60	116	Solid*	34x4	36x3½	4	4.3x6.8	28.9	L Head	Pairs	Left	Gear	Pump	
Sternberg, 2 ton	4,000	4,000	60	140	Solid*	34x4	36x3½	4	4.3x6.8	28.9	L Head	Pairs	Left	Gear	Pump	
Sternberg, 2 ton	4,000	4,000	60	160	Solid*	34x4	36x3½	4	4.3x6.8	28.9	L Head	Pairs	Left	Gear	Pump	
Sternberg, 3 ton	6,000	6,200	60	130	Solid*	36x4	40x4	4	4.3x6.8	28.9	L Head	Pairs	Left	Gear	Pump	
Sternberg, 3 ton	6,000	6,200	60	160	Solid*	36x4	40x4	4	4.3x6.8	28.9	L Head	Pairs	Left	Gear	Pump	
Sternberg, 4 ton	8,000	7,300	56	144	Solid*	36x5	40x5	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	Springs
Sternberg, 6 ton	12,000	9,000	56	144	Solid*	36x6	42x6	4	5.3x7.0	44.1	T Head	Pairs	Opp	Gear	Pump	Springs
Stewart, 1,500 lbs	1,500	2,500	32	123	Solid	34x4	35x4½	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Studebaker, 75T	2,500		25	100	Solid	34x3	34x4	4	3.3x5.0	16.9	T Head	Block	Opp	Spi'l	Thermo	
Studebaker, 7'T	8,000		50	144	Solid*	38x5	38x5	4	4.4x6.5	30.6	T Head	Pairs	Opp	Spi'l	Pump	Springs
Sullivan, 20	1,000	1,700	38	93	Solid	36x2½	36x2½	4	4.5x4.5	32.4	L Head	Sep'rt	Head	Gear	Thermo	
Sullivan, 51	1,500	1,900	38	117	Solid	36x2½	36x3	2	4.5x4.5	16.2	L Head	Sep'rt	Head	Gear	Thermo	
Superior, A	2,000	2,500		110				4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Toledo, A	2,000			102	Solid	36x3	36x4	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	Springs
Toledo, A	2,000			115	Solid	36x3	36x3	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	Springs
Toledo, B	4,000			130	Solid*	36x4	36x3	4	4.5x5.5	32.4	L Head	Block	Left	Gear	Pump	Springs
Transit, F	4,000	4,800		144	Solid*	36x4	36x3½	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Transit, T	7,000	5,600		144	Solid*	36x5	36x4	4	4.5x5.0	32.4	L Head	Pairs	Right	Gear	Pump	Springs
Transit, V	10,000	6,200		144	Solid*	36x6	40x6	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	Springs
Triumph, 1½ ton	[illegible]				Opt	Opt	Opt	4	4.5x5.3	32.4	L Head	Block	Left	Gear	Pump	
Tulsa, 15	1,500	2,400		116	Solid	36x3	36x3½	4	3.8x4.5	22.5	T Head	Block	Opp	Gear	Thermo	Springs
Tulsa, 1 ton	2,000	2,700		132	Solid	36x3½	36x4	4	4.1x5.3	27.3	T Head	Block	Opp	Gear	Pump	Springs
Tulsa, 1½ tons	3,000	2,800		144	Solid*	36x3½	36x3	4	4.1x5.3	27.3	T Head	Block	Opp	Gear	Pump	Springs
Tulsa, 1½ tons	3,000	2,800		137	Solid*	36x3½	36x3	4	4.1x5.3	27.3	T Head	Block	Opp	Gear	Pump	Springs
Universal Truck††	12,000			132	Solid*	36x5	36x5	4	5.0x6.0	40.0	Straight	Pairs	Right	Gear	Pump	Springs
Universal, C	2,000	3,200	19	130	Solid	34x3½	34x5	4	3.8x5.3	22.5	L Head	Block	Right	Gear	Thermo	Springs
Universal, A	6,000	5,400	18	132	Solid*	36x5	36x4	4	4.0x5.5	25.6	T Head	Pairs	Opp	Gear	Pump	Springs
U. S., E	4,000	4,500		132	Solid*	34x3½	36x3½	4	4.1x5.3	27.3	L Head	Block	Left	Spi'l	Pump	Springs
U. S., D	6,000	6,200		144	Solid*	34x5	36x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Spi'l	Pump	Springs
Velie, Y	5,000	5,500	50	148	Solid*	36x4	36x3½	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Velie, Z	7,000	6,500	50	148	Solid*	36x5	40x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
V. C., B		3,600		130	Solid	36x4	36x4	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Trunnions
Veerac, B††	2,000	1,850	40	86	Solid			2	4.0x4.0		2 Cycle	Sep'rt			Air	
Vulcan, 3 ton	6,000			144	Solid*	36x4	36x4	4	4.6x5.5	34.3	L Head	Pairs	Side		Thermo	
Vulcan, 4 ton	8,000			162	Solid*	36x5	36x5	4	4.4x5.5	30.6	L Head	Pairs	Side		Thermo	
Vulcan, 4½ ton	9,000			162	Solid*	36x6	36x5	4	4.4x5.5	30.6	L Head	Pairs	Side		Thermo	
Vulcan, 5 ton	10,000							4	4.4x5.5	30.6	L Head	Pairs	Side		Thermo	
Vulcan, 6 ton	12,000							4	4.8x5.5	36.1	L Head	Pairs	Side		Pump	
Vulcan, 7 ton	14,000			156	Solid*	36x7	42x6	4	4.8x5.5	36.1	L Head	Pairs	Side		Pump	
Wagenhals	800	1,000	30	80	Solid	28x3	32x4	4	3.5x3.4	19.6	L Head	Pairs	Right	Gear	Pump	
Ware, A	4,000	5,000	10	124	Solid	37x5	37x5	4	4.5x6.0	32.4	Straight	Sep'rt	S & H	Gear	Pump	Rubber
Warren, 12-30	1,000			110	Solid	32x4	32x4	4	4.0x4.5	25.6	L Head	Block	Side		Pump	
White Star, B		3,200		132	Solid	34x3½	36x4	4	4.0x4.5	25.6	L Head	Pairs	Left	Gear	Pump	S & T
White Star, C		3,600		144	Solid	34x4	36x5	4	4.0x4.5	25.6	L Head	Pairs	Left	Gear	Pump	S & T
White Star, D		4,500		156	Solid*	34x4	36x3½	4	4.3x5.5	23.9	T Head		Opp	Gear	Pump	S & T
White, G B E	1,500			120	Solid	34x4½	34x4½	4	3.8x5.1	22.5	L Head	Block	Left	Gear	Pump	
White, G T B	3,000			144	Solid*	36x4½	36x4½	4	3.8x5.1	22.5	L Head	Block	Left	Gear	Pump	
White, G T A	6,000			163	Solid*	36x5	40x4	4	3.8x5.1	22.5	L Head	Block	Left	Gear	Pump	Springs
White, T C	10,000			165	Solid*	36x5	40x6	4	4.3x5.8	28.9	L Head	Block	Right	Gear	Pump	Springs
White, TKA	10,000			145	Solid*	36x5	40x6	4	4.3x5.8	28.9	L Head	Block	Right	Gear	Pump	Springs
Wichita, A	2,000			110	Solid	34x3	34x3½	4	3.3x5.0	16.9	L Head	Block	Left	Gear	Thermo	Springs
Wichita, B	4,000			118	Solid*	34x3½	34x3	4	3.3x5.0	16.9	L Head	Block	Left	Gear	Thermo	Springs
Wilcox, I	2,000			117	Solid	36x3	36x3½	4	4.3x4.5	28.9	L Head	Pairs	Side		Pump	
Wilcox, K	3,000			117	Solid	36x3½	36x4	4	4.3x4.5	28.9	L Head	Pairs	Side	Gear	Pump	
Wilcox, J	6,000			126	Solid*	36x4	36x3½	4	4.3x4.5	28.9	L Head	Pairs	Side	Gear	Pump	
Willet	4,000			144	Solid*	36x4	36x3½	4	4.5x5.0		2 Cycle	Block	Right			
Wolverine, C	1,000	1,650	35	96	Pneu	32x4	32x4	1	4.5x5.5	8.1	L Head	Sep'rt	Right	Gear	Thermo	
Zimmerman, T	800			95	Solid	36x2	36x2	2	4.8x4.0	18.0	L Head	Sep'rt	Side	Gear	Air	

†Three wheels. ††Two-cylinder opposed. *Drives on four wheels. †††Gas-electric power plant.

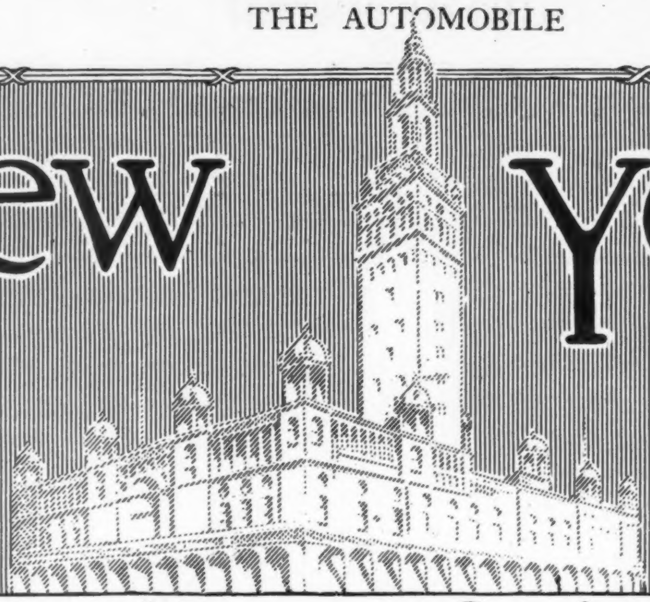
ABBREVIATIONS:—Tires: Solid*, solid dual tires in rear. **Cylinders:** Sep'rt, separate. **Valves:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling:** Thermo, thermo-syphon. **Radiator Suspension:** S & T, springs and trunnions. **Ignition:** Sing, single; Doub, double; Gov, governor; Auto, automatic. **Magneto or Generator:** Atw K, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Lubrication:** Spl-Pres, splash and pressure; In Fuel, oil fed with gasoline. **Bore and Stroke:** In decimals to nearest 1-10 inch, as 4.3=4¼ etc., .2=$\frac{3}{16}$, .1=⅛, .3=¼, .4=⅜, .5=½, .6=$\frac{9}{16}$, .7=$\frac{11}{16}$, .8=¾, .9=⅞.

Load Capacity and Complete Specifications

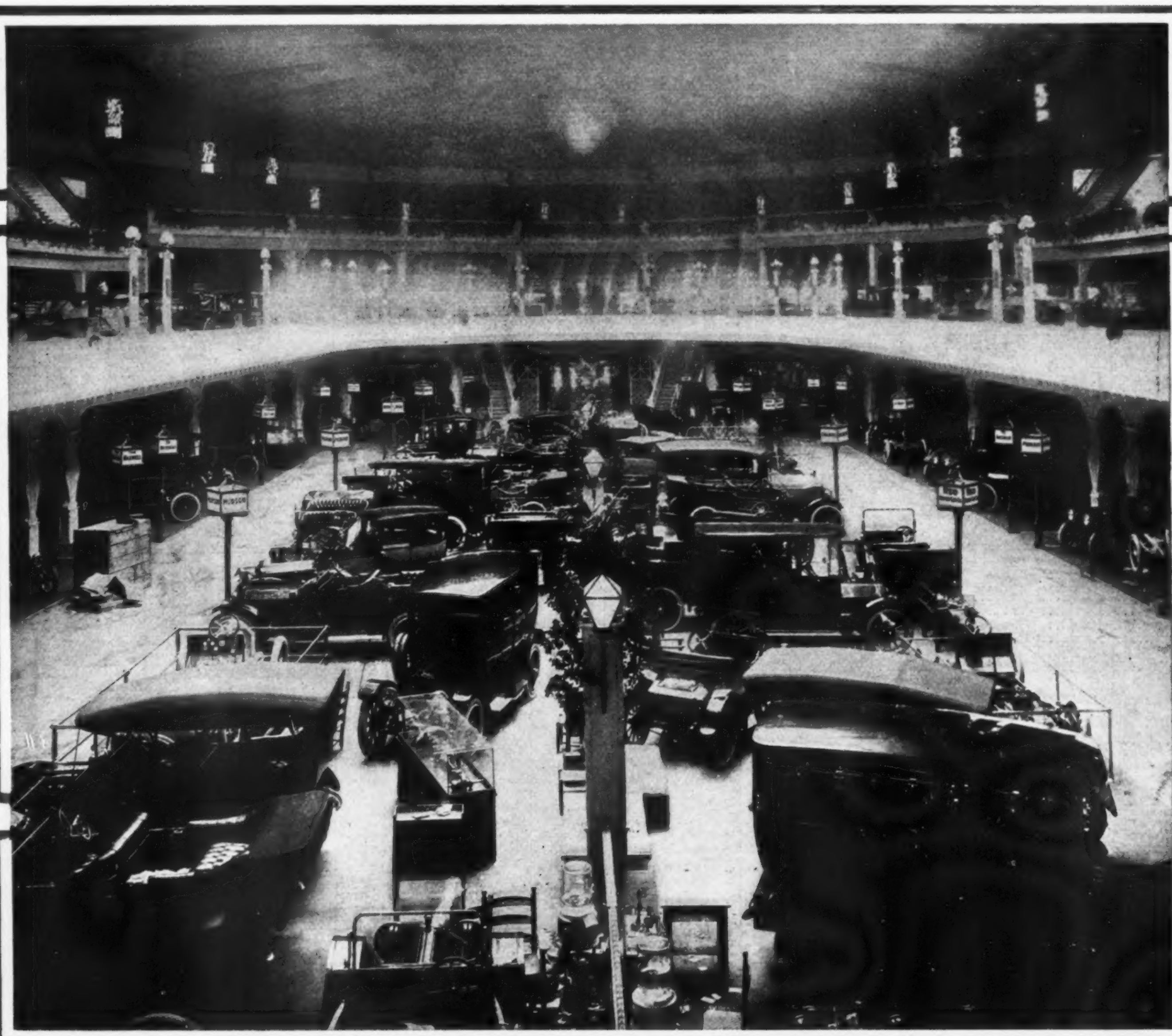
IGNITION			Carbureter	Motor Lubrication	TRANSMISSION						RUNNING GEAR					BEARINGS	
						GEARSET			Gear Ratio	Final Drive	SPRINGS		CONTROL				
System	Magneto or Generator	Control			Clutch Type	Type	Location	No. Forw'd Speeds			Front	Rear	Steering Wheel	Gearshift	Emergency Brake	Gearset	Rear Axle
Sing	Eisemann	Auto		Splash	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center		
Sing	Eisemann	Auto		Splash	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center		
Sing	Eisemann	Auto		Splash	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center		
Sing	Eisemann	Gov	Zenith	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Sing	Eisemann	Gov	Zenith	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Sing	Eisemann	Gov	Zenith	Spl-Pres	Disk	Sel	Uint M	3		Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Sing	Eisemann	Gov	Zenith	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Amid	4	9.0-1	Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Roll
Dual	Bosch	Hand	Stromberg	Splash.	Disk	Sel	Amid	4	9.0-1	Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Roll
Sing	Eisemann	Auto	Stewart	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Left	Center	Left		Ball
Sing	Eisemann	Auto	Stewart	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Left			Ball	Ball
		Auto	Stewart	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Left			Ball	Ball
		Auto	Stewart	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Left			Ball	Ball
		Auto	Stewart	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Left			Ball	Ball
		Auto	Stewart	Spl-Pres	Disk	Sel	Unit M	3		Bevel	½ Ell	½ Ell	Left	Right	Left	Ball	Ball
Dual	Eisemann	Auto		Splash	Disk	Sel	Amid	3		Chain	½ Ell	Plat	Right	Right	Right	Ball	Roll
Dual	Eisemann	Auto		Splash	Disk	Sel	Amid	3		Chain	½ Ell	Plat	Right	Right	Right	Ball	Roll
Dual	Eisemann	Auto		Splash	Disk	Sel	Amid	3		Chain	½ Ell	Plat	Right	kight	Rignt	Ball	Roll
Dual	Eisemann	Auto		Splash	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Rignt	Ball	Roll
Dual	Eisemann	Auto		Splash	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Rignt	Ball	Roll
Dual	Eisemann	Auto		Pressure	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Eisemann	Auto		Pressure	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Sing	Bosch	Fixed	Rayfield	Spl-Pres	Disk	Sel	Amid	3	3.4-1	Bevel	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Sing	Eisemann	Auto	Own		Exp Bd	Sel	Unit M	3		Int G	½ Ell	½ Ell	Right	Center	Center	Ball	Ba'l
Sing	Eisemann	Auto	Own		Exp Bd	Sel	Unit M	4		Int G	½ Ell	½ Ell	Right	Center	Center	Ball	Ball
Sing	Bosch	Fixed	Schebler	Spl-Pres	Disk	Plan	Unit J	2		Chain	Ell	Ell	Left	Pedal	Center	Ball	Ball
Sing	Bosch	Fixed	Schebler	Spl-Pres	Disk	Plan	Unit J	2		Chain	Ell	Ell	Left	Pedal	Center	B & P	Ball
Sing			Rayfield	Splash	Cone	Sel	Unit J	3	7.8-1	Chain	½ Ell	½ Ell	Right	Right		Roll	Ball
Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Unit M	3	9.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Unit M	3	9.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Cone	Sel	Amid	3	12.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Briggs	Hand	Stromberg	Splash	Disk	Sel	Unit J	3	9.4-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual		Hand	Stromberg	Splash	Disk	Sel	Unit J	3	10.7-1	Chain	½ Ell	½ Ell	Right	kight	Right	Roll	Roll
Dual	Briggs	Hand	Stromberg	Pres	Disk	Sel	Unit J	3	12.1-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Sing	Bosch	Hand	Stromberg	Splash	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Ball
Doub	Opt	Hand	Opt	Splash	Cone	Sel	Unit M	3		Chain	½ Ell	Plat	Right	Right	Right	Plain	Ball
Doub	Opt	Hand	Opt	Splash	Cone	Sel	Unit M	3		Chain	½ Ell	½ Ell	Right	Rignt	Right	Plain	Roll
Doub	Opt	Hand	Opt	Splash	Cone	Sel	Unit M	3		Chain	½ Ell	½ Ell	Right	Rignt	Right	Plain	Roll
Doub	Opt	Hand	Opt	Splash	Cone	Sel	Unit M	3		Chain	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
Doub	Briggs	Hand	Schebler	Spl-Pres						Ext G	½ Ell	½ Ell	Right		Pedal		B & R
Dual	Eisemann	Hand	Holley	Splash	Disk	Sel	Unit M	3		Worm	½ Ell	½ Ell	Left	Center	Center	P & B	Ball
Dual		Hand	Holley	Splash	Disk	Sel	Amid	3	12.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	G & A		Cone	I. C	Amid	3	8.0-1	Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Roll
Dual	Bosch	Hand	G. & A		Cone	I. C		3	7.8-1	Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Roll
Doub	Bosch	Hand	Stromberg	Spl-Pres	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Doub	Bosch	Hand	Stromberg	Spl-Pres	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	Schebler	Spl-Pres	Cone	Sel	Amid	3	8.0-1	Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Ball
Doub	Opt	Hand	Krice	In Fuel	Disk	Plan	Amid	2	6.2-1	Chain	¾ Ell	Ell	Left	Left	Pedal	Ball	Ball
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Unit Jt.	3		Chain	½ Ell	½ Ell	Right	Right	Right		
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right		
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right		
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right		
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right		
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right		
Doub	Briggs	Hand	Marvel	Spl-Pres	Cone	Plan	Unit M	2	9.0-1	Chain	½ Ell	½ Ell	Center	Pedal	Pedal		Roll
Dual	Briggs	Hand	Kingston	Spl-Pres	Disk	Sel	Amid	4		Bevel	Ell	Plat	Right	Pedal		Roll	B & R
Doub	Bosch	Fixed	McCord.	Splash	Cone	Sel	Amid	3		Bevel	½ Ell	¾ Ell				Plain	B & R
Sing	Eisemann	Auto	G. & A	Spl-Pres	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
Sing	Eisemann	Auto	G. & A	Spl-Pres	Disk	Sel	Amid	3		Bevel	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
Sing	Eisemann	Auto	G. & A	Spl-Pres	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
Sing	Mea	Hand	Own	Spl-Pres	Cone	Sel	Amid	4		Bevel	½ Ell	½ Ell	Right	Right	Right	Ball	Ball
Sing	Mea	Hand	Own	Spl-Pres	Cone	Sel	Amid	4		Bevel	½ Ell	½ Ell	Right	Right	Right	Ball	Ball
Sing	Mea	Hand	Own	Spl-Pres	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Ball
Sing	Mea	Hand	Own	Spl-Pres	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell	Left	Center	Left	Ball	Ball
Sing	Mea	Hand	Own	Spl-Pres	Cone	Sel	Amid.	4		Chain	½ Ell	½ Ell	Left	Center	Left	Ball	Ball
Opp	Opp	Hand	Stromberg	Spl-Pres	Cone	Sel	Unit J	3	7.3-1	Chain	½ Ell	½ Ell	Right	Center	Center	B & R	Ball
Opp	Opp	Hand	Stromberg	Spl-Pres	Cone	Sel	Unit J	3	8.3-1	Chain	½ Ell	½ Ell	Right	Center	Center	B & R	Ball
Dual	Bosch	Hand	Bennett	Splash	Cone	Sel	Amid	3		Chain	Ell	Plat				Roll	Roll
Dual	Bosch	Hand	Bennett	Splash	Cone	Sel	Amid	3		Chain	Ell	Plat				Roll	Roll
Dual	Bosch	Hand	Bennett	Splash	Cone	Sel	Amid	3		Chain	Ell	Plat				Roll	Roll
Dual	Eisemann	Auto	Zenith	In Fuel	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Pedal	Center	Roll	Roll
Sing	Battery	Hand	Holley	Splash.		Fric	Amid			Bevel	½ Ell	½ Ell	Left	Left	Pedal	Roll	Roll
Sing	Battery		Schebler	Spl-Pres	Disk	Plan	Amid	2		Chain	¾ Ell	Ell	Right	Right	Pedal	Plain	Ball

ABBREVIATIONS:—Clutch: Exp B, expanding band; Con B, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; I. C., individual clutches. **Gearset Location.** Amid, amidships; Unit M, unit with the motor; Unit J, unit with the jackshaft; Unit X, unit with the rear axle **Drive:** Bevel, shaft with bevel gears at rear axle; Worm, shaft with worm gears at rear axle; Ext G, external gear; Int G, internal gear. **Springs:** ½ Ell, semi-elliptic; Ell, ellipitc; ¾ Ell, ¾ elliptic; Plat, platform. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller, B R & P, ball roller and plain.

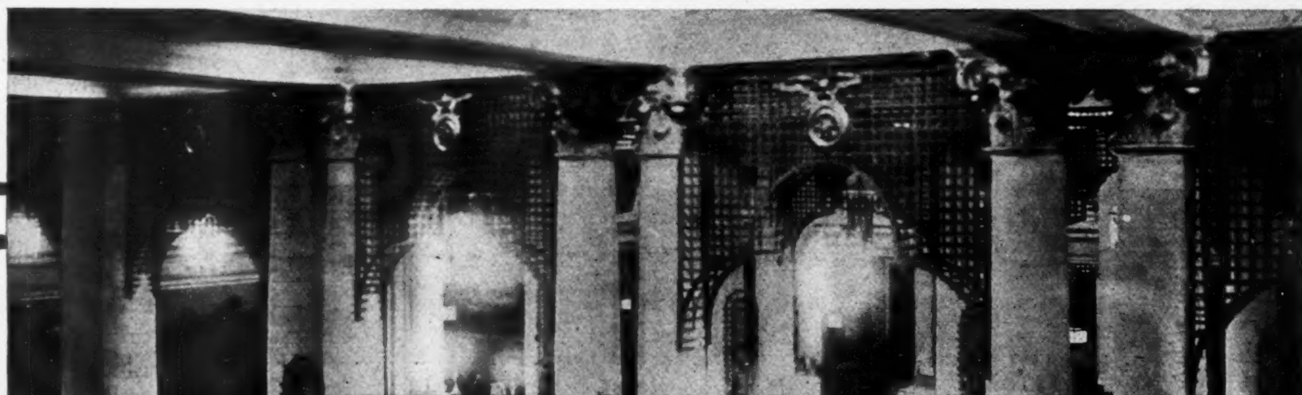
New York's



Exhibitions of Passenger Cars, Accessories, etc.



General view of Madison Square Garden, looking towards main entrance. The scheme of decoration is that of a crystal palace with the walls under the gallery continuous mirrors, the gallery faces and pillars in white. The roof studded with brilliant electric chandeliers relieved with flowers. A general profusion of flowers along the face of the second gallery adds a touch of summer to the setting



In the Grand Central Palace the cars are exhibited on two floors. The general scheme of the main floor is shown on this page. The space is broken up by the dual pillars. The scheme of decoration is that of a Viennese garden with a generous supply of lattice work and the walls covered with touring scenes from the different states of the Union, the general decorative effect being exceedingly pleasing

Main entrance to Madison Square Garden

Main entrance to Grand Central Palace

Automobile America at the Shows

Eighty-Eight Different Makers of Pleasure Cars Represented Electric Cranking, Lighting and Ignition Systems in Favor

WITH the slogan "In Two Buildings for 2 Weeks," the largest automobile show yet staged in this country swung open its doors to an exacting public at 8, January 11. For the next 2 weeks the metropolis will be the Mecca of all those interested in the motor car and its relatives. This year both the Palace and the Garden are under the same management and they opened simultaneously. Although no official count of the attendance for the opening day has yet been given out, Secretary Merle L. Downs gave it as his opinion that about 30,000 people viewed the cars and accessories at both the Garden and the Palace on Saturday night.

A few statistics of this, the Thirteenth National Automobile Show, will serve to reveal the magnitude of the undertaking which has been so ably managed by the committee, consisting of Col. George Pope, chairman, Alfred Reeves, and Merle L. Downs. For the pleasure car exhibition there are 467 exhibits, including car makers, accessory makers, and motorcycle manufacturers. At the Garden, where are assembled the car manufacturers who formerly composed the A. L. A. M., which has now passed out of existence, forty-two makes of pleasure cars are submitted to the public, while at the Grand Central Palace, forty-six other makers of pleasure vehicles are holding forth.

So far the attendance has run way ahead of that of last year in both Palace and Garden, although the greatest percentage of increase is at the Palace. As compared with the Paris Salon the combined floorspace of the two buildings used to stage this year's show exceeds that of Paris by 15,000 square feet. The number of exhibitors, although below the total of 565 which exhibited at Paris, when added to the number who will appear for the second week will swell the total to 702.

There are a number of new cars among the Palace gathering. The Edwards-Knight, the Davis, Lenox, the Chevrolet, the Little, the Keeton, have been brought into the fold and installed among their older contemporaries at the Palace. Yet this pleasure at seeing the newcomers is somewhat tempered by the fact that several of the cars which were with us when the industry was young are now absent. Among these may be mentioned the Brush, the Thomas, Elmore, Marquette, Gaeth, Corbin, DeTamble and the Lion.

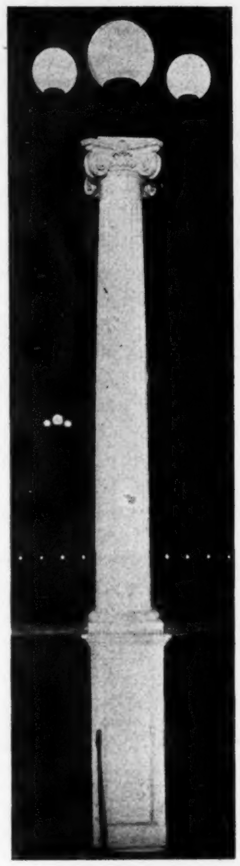
Of course the electrics this year are few and far between at either building; but this is easily accounted for when it is remembered that these makers decided to be exclusive recently and held a show of their own several weeks ago. Only a few electric makers deigned to appear at the gasoline assemblage, among which more democratic contingent were the Buffalo, Borland, Argo, Church-Field and Standard.

Entering the Garden, we find ourselves in a veritable crystal palace emblazoned with thousands

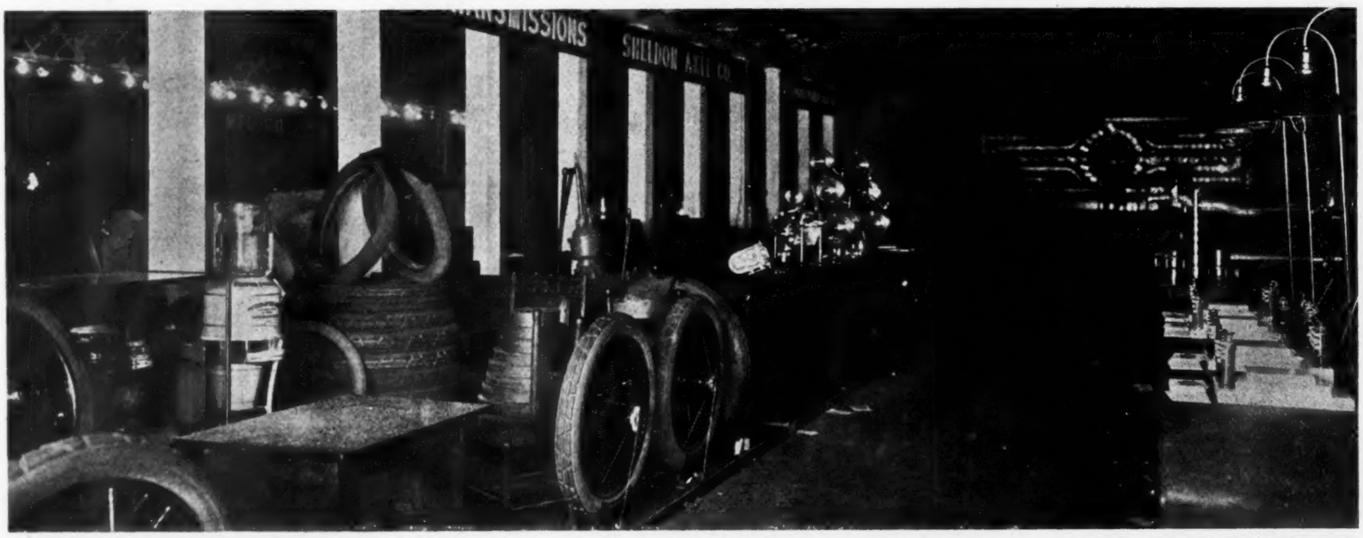
of electric lights and the entire outer wall of the lower floor lined with mirrors. The color scheme is white and gold with many touches of green and red here and there. One idea of the use of the mirrors is stated by the show committee to give an effect of great spaciousness to the already enormous structure. The ceiling is covered with azure material which lends further to the idea of infinite space as of a large slice of sky above the array of automobiles and their parts.

Three enormous crystal chandeliers and many smaller ones add to the decorative scheme and hang from the dome, while along the balconies and the railings flowers are entwined in infinite array. Lattice work adds to the decoration of the flowers and tempers the brightness of the profusion of electric bulbs. A noteworthy feature of the lighting arrangement this year is the placing of rows of lights above each show space under the balcony on the first floor of the venerable Garden. Heretofore some of these spaces have been a little dark, due to the absence of sufficient light with the attendant disadvantages to the exhibitors who wish to show off every feature of their product. But this year there are no unilluminated corners for the many incandescent bulbs take care of this and they are assisted in their work by the mirrors along the side walls at the back of the booths. Indeed so far as light is concerned the management has left nothing to be desired.

At the Grand Central Palace a less expensive decoration is necessary, for the building itself is exceedingly attractive when devoid of any festive dress. It has been converted into a palace of Versailles, we are told. There are great landscape paintings adorning the walls which are assisted in their work of beautification by lattice construction into which flowers have been entwined. These wall panels depict scenes of famous motoring spots throughout the country. The Delaware Water Gap, the Berkshire Hills, the Palisades of the Hudson form the decorations for the walls on the lower floor, while on the mezzanine floor western scenes predominate. Here we see the Grand Canyon, Rocky Mountain canyons and passes and beautiful California views. Everywhere masses of flowers have been used unsparingly. It is hard to conceive a more beautiful effect than that worked out on so extensive a scale for the approval of the great motoring public.



Show space arrangement this year is somewhat more cramped at the Garden and is responsible for the perhaps lower total number of cars shown. There are no machines on the second balcony at the Garden, while the concert hall, lower floor, which was used as an overflow space last year, is not pressed into service this time. In the basement the accessory space has also been curtailed somewhat. At the same time the second balcony has been somewhat widened, which partially compensates for the other subtractions. At the Palace practically all the available space is utilized. Here the car exhibitors have the first floor exclusively, and they also command most of the mezzanine, although a number of



Upper—View down one of the corridors in the Concert Hall. Lower—Accessory exhibits in basement at Madison Square Garden

accessory exhibitors are also seen here. The balcony is naturally devoted entirely to accessories. Space has also been allotted to the motorcycle contingent which appears in connection with the National Shows for the first time.

The attendant social functions and business meetings always in evidence at show time have not been overlooked this year. On Monday a meeting of the executive board of the A. A. A. was held at the Hotel Belmont, while on Tuesday evening a dinner was tendered to the Pioneer Automobile Manufacturers by the Big Village Motor Boosters at the Murray Hill Lyceum at 11 o'clock. On this day also the executive committee of the Motor and Accessories Manufacturers' Association, the finance committee of the same organization and also its board of directors held meetings at their offices on West Forty-second street. The Motor and Accessories Manufacturers were also active on Wednesday, when at 5:30 p. m. at the Waldorf-Astoria they held their tenth annual meeting and a little later partook of their fifth annual banquet.

The social program for Thursday includes a dinner in honor of W. H. Blood, Jr., given by the Electric Vehicle Association of America at Delmonico's, and the first meeting of the midwinter session of the Society of Automobile Engineers at 9:30 a. m. in the ballroom of the Hotel McAlpin. The S. A. E. also holds professional sessions both Thursday afternoon and evening, while on Friday, both morning and afternoon will be devoted to serious work by this body, and in the evening the McAlpin will again be the scene of the annual society dinner. More professional sessions of this society bring the scheduled doings of the week to a close on Saturday.

Although we have mentioned many of the important events which the week has held in store for the visiting automobile hosts, there are many unscheduled entertaining features given by various organizations to members in attendance at the show. All in all, it will be a busy week for those connected with the industry. Many organizations have planned dinners beginning at night after the show closes which, although alive with features for enjoyment, work to the detriment of all-essential sleep.

Decorations at the Garden and at the Palace as well lend themselves admirably to the display of the automobiles inasmuch as they are subdued and harmonize with most any car body color. This year there is an absence of striking color designs on most of the cars shown, although here and there a flashy body type is in evidence. The tendency seems to be toward more subdued colors and genuine luxuriousness of finish and equipment rather than freakish ideas designed to make a show of the occupants of the car. Conspicuousness in body colors has had its day if the showing in New York this year can be regarded as any criterion. Dark reds, blues, blacks and greens predominate and the finish in every case reflects the great care which has been exercised by every maker for harmony in body colors as well as for the ultra-refinement of finish.

Every style of body is to be seen. Touring cars, limousines, coupés, roadsters bring out the great strides which have been made in the body builders' art. Every conceivable feature for the comfort of the passengers has apparently been provided, and it is hard to see where further improvement is possible in body design. The fore-door type is universal, although many of the makers are exhibiting raceabouts of the characteristic openness. Among these may be mentioned the National, Moon, Mercer, Pathfinder, Stutz, Fiat, Abbott and a score of others.

In nearly every case body interiors correspond in color to the exteriors, although often in lighter shades. Black bodies have black leather finish within; dark blue types have corrresponding seating and side leather; brown exteriors carry brown

Upper—Diagonal view of the main floor at the Garden, looking toward the entrance
Lower—Another diagonal view at the Garden, looking away from the main entrance

leather cushions and linings. Everywhere harmony is the keynote.

Looking at specific instances of ultra refinement in body design we may turn to the Locomobile limousine, which is a two-compartment type, the forward for the driver. This machine is of a dark maroon color and ranks in beauty favorably with any car yet brought out for the fastidious tastes of the automobile buyer. The interior of the passenger compartment of this beautiful car is transformed into a miniature drawing room. The walls and ceiling are lined with an old rose material into the pattern of which a flower design is woven. Miniature golden lamps are placed in the corners and every detail which will add to the comfort of the occupants has been included. Milady could scarcely wish for anything more in the way of refinement.

Striking in color is the Premier touring coupé, so called. This machine is finished in a bright green outside and shows a tendency to amalgamate foreign ideas of body construction with those of the American maker. This coupé is constructed somewhat on the landaulet idea, the top folding down, although the sides are on the coupé order. The top is also of the striking green which characterizes the body proper. Within, the finish is very elaborate, being in bird's-eye maple and light brown upholstery. Drive is on the left and control in the center. To add to the distinctive appearance of the whole, wire wheels are used, bringing out still more the dash of foreign style which has been added to the body design.

Stevens-Duryea models this year have a foreign air also as regards body design. The hood is of a new sloping type, rounded into the dash in a way which we are wont to credit to our contemporaries from England, France, Belgium, Germany or Italy. Fenders, too, on these cars are worthy of note in that they are very wide and substantially attached to the chassis. They are entirely welded together, no rivets being used. This construction but reflects the welding tendencies which are in evidence on many of the all-steel truck bodies now upon the market.

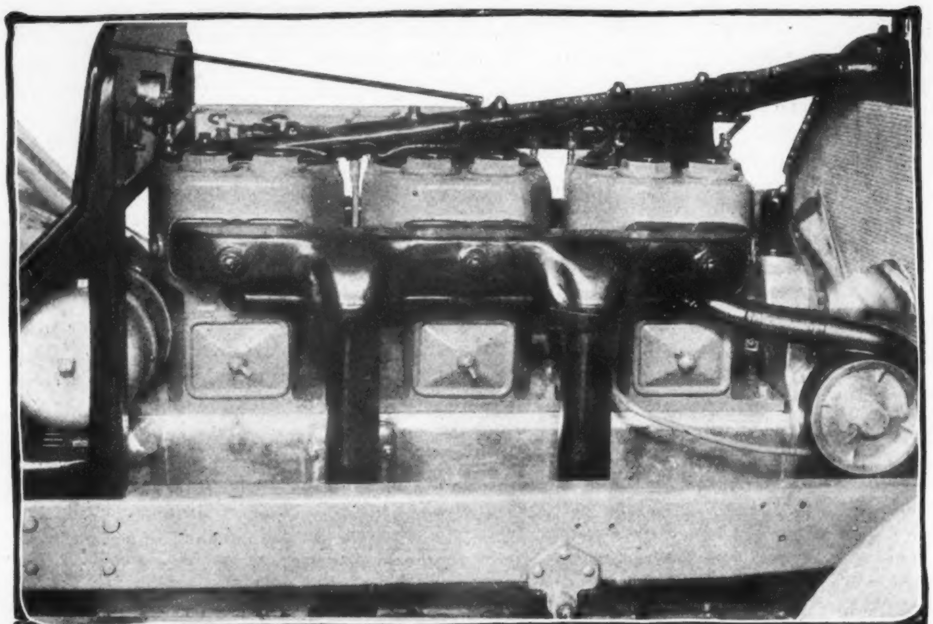
Very distinctive is the sedan limousine exhibited by Peerless. This machine has the rounded roof and the air of the royal equipage of earlier days. It is finished outside in yellow and black, while the interior leaves nothing to be desired in the way of luxuriousness. Packard, too, appears with the usual richness of body color and fineness of finish. Three Packards are shown, one an outside-drive coupé model finished in a dark blue. A noticeable feature of the body design of these cars this year is the absence of a door at the left of the driver's seat. This is true of the open models only, however, the closed cars retaining the door. The left front side of the bodies being thus closed, it is necessary for the driver to enter from the right front side. Reasons advanced for the design convey the idea that the left front door is of very little value inasmuch as the Packard control levers, which are placed at the left of the driver, make access from this side rather cramped and the other door is usually made use of anyway.

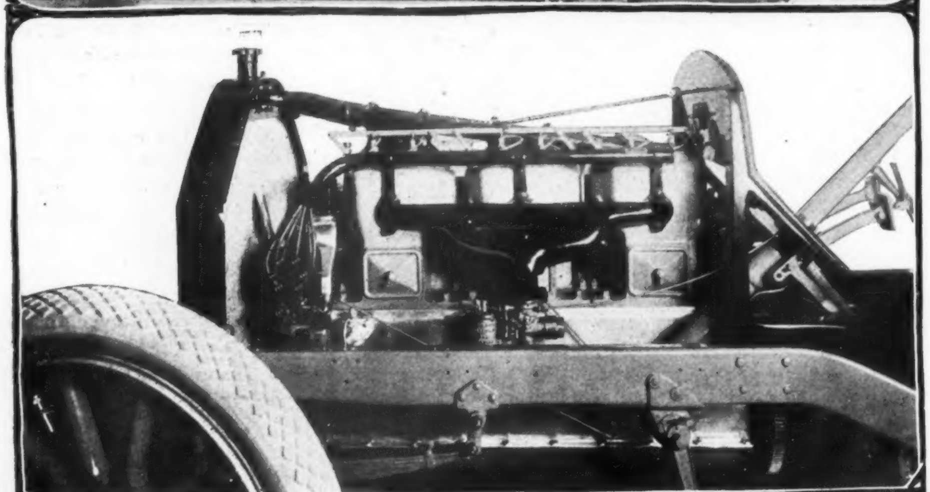
Exhibitors are continually searching for novelties which will attract the spectators to their booths. An original idea has been used by the Packard company. In the glass of the headlights of one of the cars attractive scenes have been worked depicting Packard cars in the foreground. When the headlights are switched on, these scenes show to best advantage. Though a small thing, the idea is unique and attracts much attention.

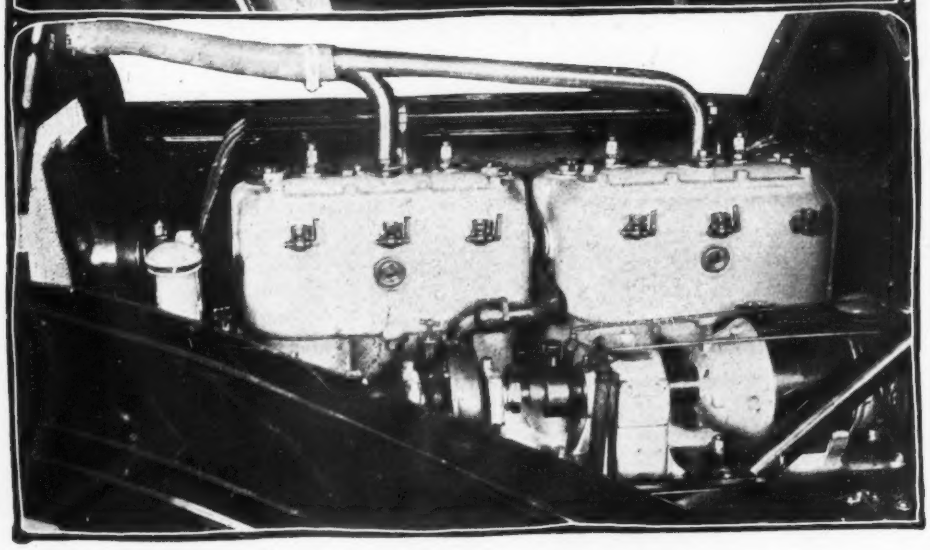
Alco exhibits a single touring car model in its space at the lower end of the balcony at the Garden. It is placed on a raised platform at the back of the space and in front of it are spread rugs within the confines of the space, the boundaries of which are defined by brown rope draperies, thus further carrying out the color scheme. No chassis is shown.

A number of the makers are not showing a stripped chassis this year, among which are the Packard, Flanders, Oldsmobile and Maxwell, in addition

Two views of some of the exhibits on the main floor at the Grand Central Palace, showing the absence of crowding of the cars on display and giving an idea of the decorative scheme







New Motors Seen at the Shows

Mitchell six (at top) is an entirely new design for the company and is a T-head engine with cylinders in pairs. It makes use of a transverse forward shaft for driving the magneto and water pump. The exhaust manifold has two branches which unite below the frame level. Both sets of valve mechanisms are inclosed and the Esterline cranking motor is mounted transversely at the right rear beneath the footboards, whereas the lighting generator is located under the driver's seat. The motor is clean cut. In fact, the entire chassis deserves mention on this score. The three-blade propeller type of fan is mounted in rear of the radiator. The motor shown at the bottom is that of the six-cylinder 60-horsepower Firestone-Columbus. It has a bore of 4.25 and a stroke of 5.25 inches. The North East electric system is used

to the Alco and several others. Nevertheless, chassis revealing mechanical constructions are in evidence at most of the spaces and it is to be noted that they are all in charge of better-informed attendants than was the case at shows of the past. Intelligent answers to questions has been the rule this year, for the maker realizes that the public is becoming motor-wise and must have facts. Thorough knowledge of the mechanical features of the car must now flow more freely than commendatory phrases regarding body advantages which are equally as evident to the layman as to the demonstrator.

Many new sixes are seen for the first time at the show. There is the new Garford, which has been heralded for some time, and it involves many features of foreign design, although produced by an American engineer—the creator of Overlands. The elements of torque tube construction, rear axle design and general chassis arrangements are more like those seen at the Importers' Salon at the Astor than typical American practice. The placing of a single headlight in the top of the radiator is a feature of the new Garford which cannot be credited to anyone save the designer of the car. This feature has already been discussed in a previous issue of THE AUTOMOBILE. Another new six is the Mitchell, which also involves a number of ideas obtained from the other side. The exhaust manifold on this car is perhaps the most radical feature for pleasure car design. There are two passages leading from the horizontal section of the manifold where it connects to the cylinders and running vertically downward into the main exhaust pipe which passes horizontally back to the muffler. Some such form of manifold construction is often utilized in racing car design, but it appears as rather a departure as applied to the passenger vehicle.

The Lozier light six also comes in for its share of attention inasmuch as it involves a number of features not formerly looked upon as characteristics of Lozier construction. The motor is an L-head type and carries a number of refinements, details of which would be irrelevant here. The reader is referred to last week's issue of THE AUTOMOBILE for a more comprehensive summary of the car's design. Although this new Lozier product is not in the small car class, it is designated as the light six to distinguish it from the larger model, which has heretofore been the exclusive production of the Lozier plant.

At the Palace the Chevrolet and Little sixes are on display for the first time, being products of subsidiaries of the recently-formed Republic Motors Company, a highly capitalized combine.

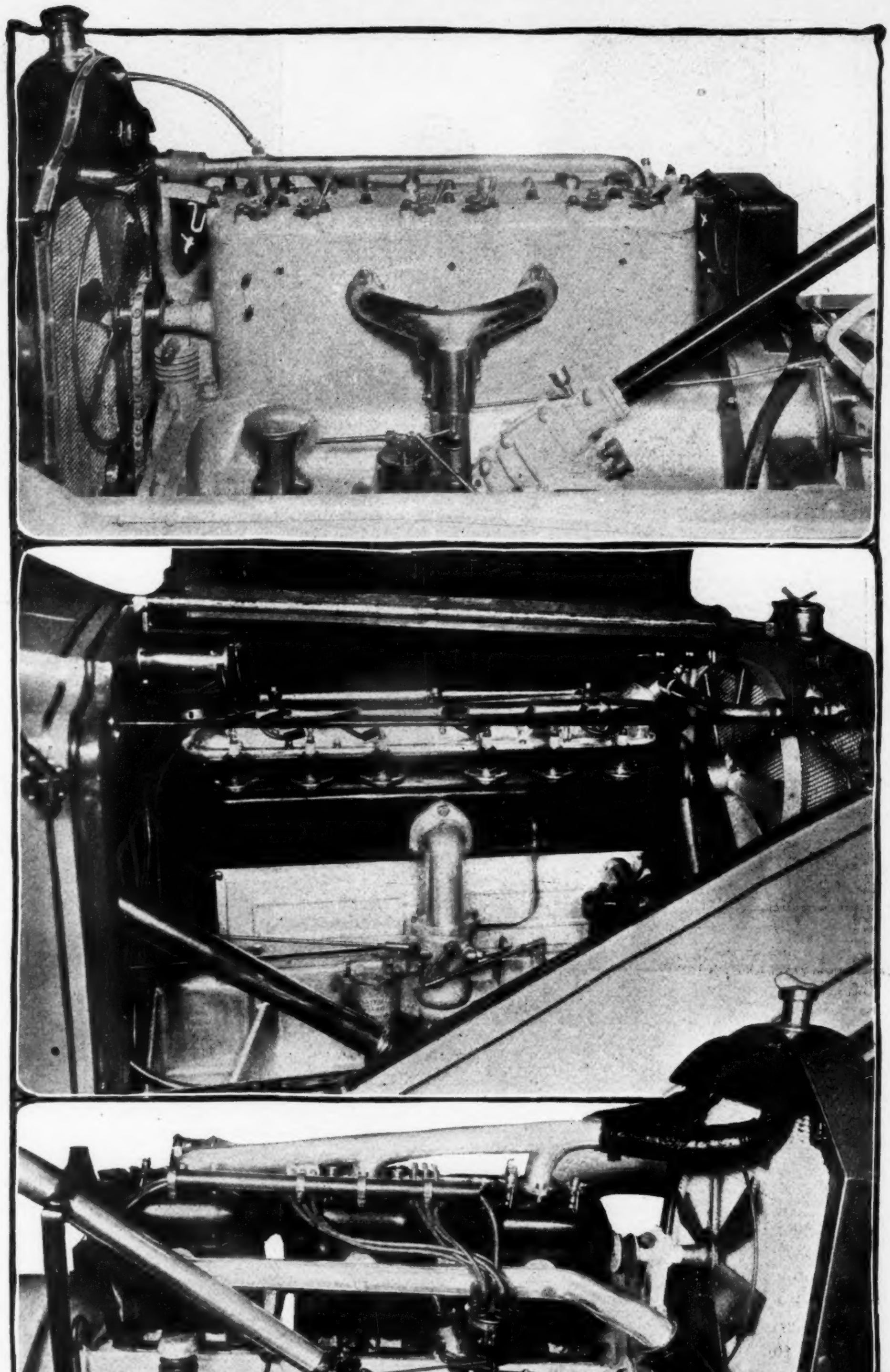
The Chevrolet involves many of the ideas of Louis Chevrolet, who has won distinction in the racing game. Naturally, a number of foreign ideas are incorporated. At the Palace also we find the new Studebaker line, which comprises two fours and a six of monobloc-cast motor construction. Here also is the new six-cylinder Stutz, product of Indianapolis. The little Herreshoff six-cylinder type is also to be seen, as well as a number of others.

Among the non-poppet valve type motor equipped cars, the Palace houses a rival of the Knight type, inasmuch as the Speedwell company exhibits its new car equipped with a Mead rotary-valve engine. This motor, although it has been exhibited at the shows before, is seen for the first time as a part of any particular make of car. The motor involves the use of two sleeves, one at either side of the cylinder heads of the monobloc casting, which sleeves are driven from the crankshaft by silent chains. When slots in these sleeves register with similar openings in the cylinder walls they permit the passage of gases either to or from cylinders as the case may be. Lubrication of these sleeves is accomplished through the placing of a small quantity of lubricating oil in the gasoline. As applied to the Speedwell car this motor appears at the show in connection with a touring car model.

The Knight-equipped cars this year have been augmented by the Edwards car, which makes its début at the Palace. The older adherents to this sleeve-valve motor, namely, the Stearns, Stoddard and Columbia concerns, are again on deck. The Stearns people have added the six-cylinder Knight-equipped car to their line, which shows no constructional features differing radically from those incorporated in this sleeve-valve motor as placed on cars of this make somewhat over a year ago when the company switched from the poppet-valve motor to the exclusive manufacture of the design of Charles W. Knight.

The Edwards-Knight, details of which appeared in a previous issue of THE AUTOMOBILE, is the only American car in this year's show to be equipped with a worm-driven rear axle. The worm is placed underneath the wheel, a position recommended by most engineers versed in this subject, although there are many who champion the use of the overhead worm.

Most notable of all the tendencies at the show this year is the almost universal adoption of some form of cranking system. A careful canvass of all the cars to be seen at the Garden shows that out of fifty models under investigation 70 per cent. are equipped with electric starting in some form or

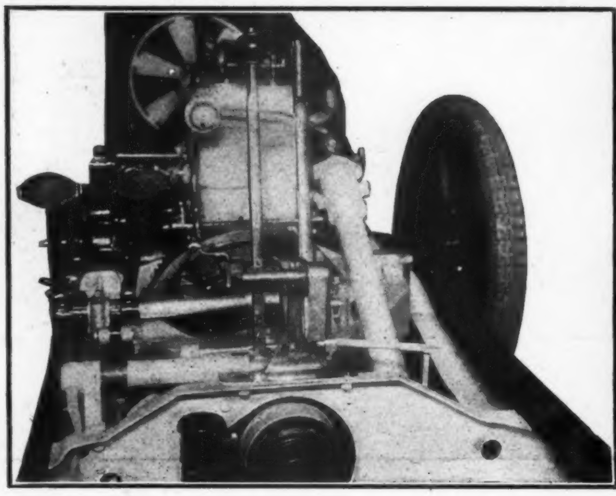


New Motors Seen at the Shows

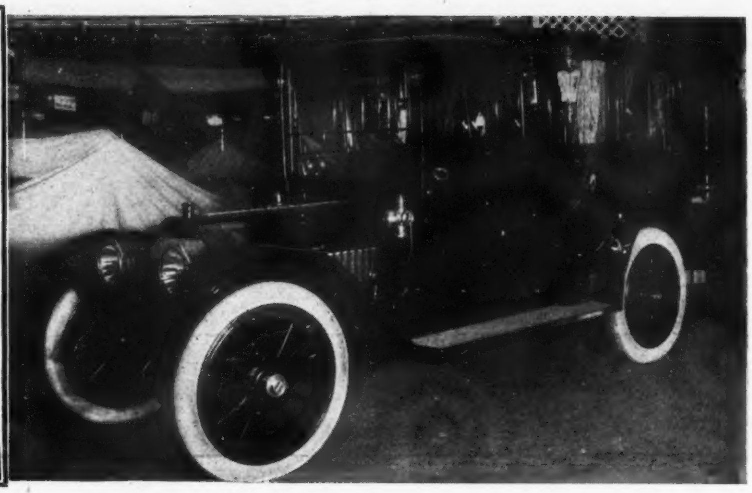
Garford six (at top) with block casting having top portion of crankcase integral with cylinders and cylinder heads separate in the form of a large plate

American six (center) is a T-type block design, the intake side of which is shown herewith. The cylinders measure 4.5 by 6 inches. The Electro motor-generator for cranking and lighting is used

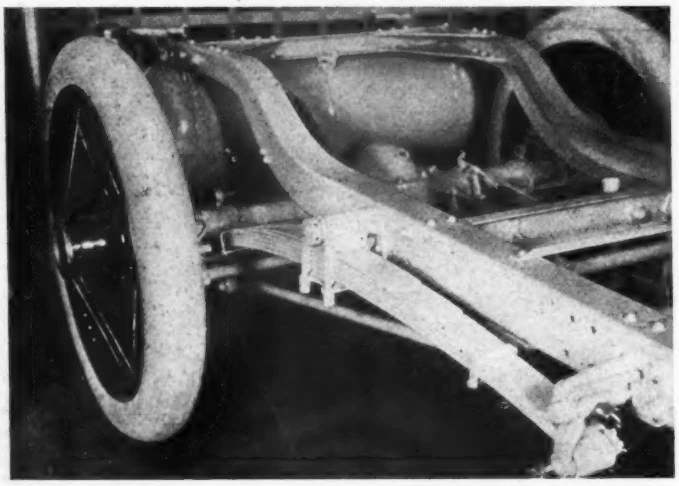
Havers six (bottom) is not a new motor, but shows that type of design in which the cylinders are cast in pairs and have valves located on one side. The normal-sized water pipes for the thermo-syphon cooling are seen, as well as the Atwater-Kent ignition apparatus



Showing how propeller shaft is carried through large opening in center of cross piece of frame and how levers are mounted



One of the luxurious berline bodies is the Locomobile finished lavishly with gold trimmings



The Lanchester type of spring on the new Edwards-Knight chassis, showing how spring weight is carried on the car frame

other. Three of these cars carry acetylene starters, while four machines of this fifty are provided with an air starting system. Only six carry no provision for cranking the motor from the seat. In every case where electric starting is used, there is also electric lighting. Many of the electric starting systems with which our readers are already familiar are prominent in the chassis on display, although many new makes are also placed on well-known cars.

Considering the electric cranking situation, it is a noteworthy fact that the majority of the systems make use of three separate units to perform the various electrical functions, although there are a number of instances of the use of a single combined unit which takes care of the ignition, lighting and cranking. The principal illustration of this type of installation is the Delco system as utilized on the cars of the General Motors make. In all other cases under investigation either the magneto lighting generator and cranking motor are separately installed or two of these units are combined. Most of the two-unit applications combine the motor and generator into a single machine, while the magneto is entirely separate. The table, page 228, covering fifty machines taken at random, serves to bring out great diversity in the use of electric equipment on the cars of this year. The two-unit system, by which is meant the use of two electrical components to take care of the three functions, starting, lighting and ignition, usually appears in a combination of the motor and generator, while in a few cases, notably the Westinghouse design, the electric generator and the magneto are combined in one unit while the cranking motor is made a separate unit.

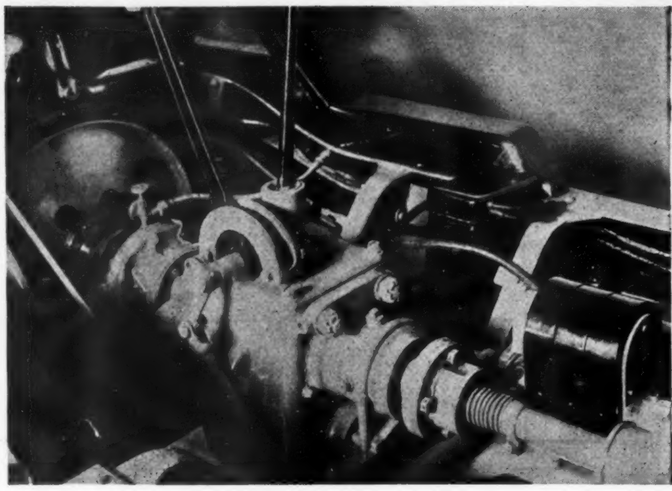
Segregating electric lighting from the other two electrical functions of cranking and ignition, it may be said that there are very few cases this year which do not incorporate electrical lighting as standard equipment, even though the starter may be of another type or one may not be used at all. The American buyer demands electrical lighting and it has become practically a universal feature, every concern fitting electric lights to at least one of its models. Of course, where no electric starting system is employed a storage battery charged from some external source is used for lighting.

The addition of these combined electric systems on such a large majority of the cars has meant the cluttering up of the power plants more or less, dependent upon the ingenuity of the engineers making the installation. Very little uniformity exists in the method of attachment of electric generators and cranking motors, although the application of this motor so that it will indirectly turn the crankshaft through gearing on the face of the flywheel predominates. Cranking motors the gears of which engage with these flywheel teeth are placed in innumerable positions, the applications beihg almost as varied in number as there are different makes of cars. One engineer places the electric motor forward of the flywheel, another back of it, another underneath, while a fourth mounts it above and crosswise, thus using bevel, spiral or worm gearing in connecting to the flywheel teeth. Several cases are to be noted in which the starting motor drives through silent chain or timing gears at the forward end of the engine.

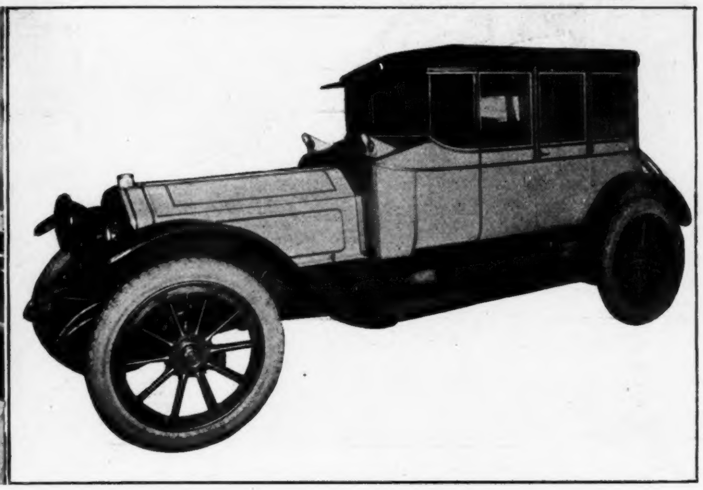
Then there are other installations which replace the flywheel of the engine by the rotating part of a motor generator. Notable examples of this is the design made by the United States Light & Heating Company and the installation mounted in the Rambler car. More detailed descriptions of starting systems appear elsewhere in THE AUTOMOBILE.

Air tire pumps appear on many of the cars exhibited, which is another feature tending toward convenience of the car operator. Makers installing air starting systems on their models, of course, have very little trouble in adding a connection which will allow the conveying of air to the tires. However, other makers who have electrical equipment have provided separate compressors or small tire pumps as an additional accessory. Considerable diversity of location of such pumps is in evidence.

Underslung springs are gaining in popularity. This construction must not be confused with the true underslung principle which involves the placing of the frame under the axles and suspending it by the springs, as in the American and Regal constructions. In underslinging the springs, the frame remains above the axles, while the springs are held up against the axle from underneath by means of spring bolts, as distinguished from the fastening of these springs above the axles as in average practice. This design must be credited to the Franklin company.



Compact gearbox on new Mitchell chassis and how gearshift and brake levers are mounted on it



New Peerless sedan body which is attracting general attention. The sides and front are all windows

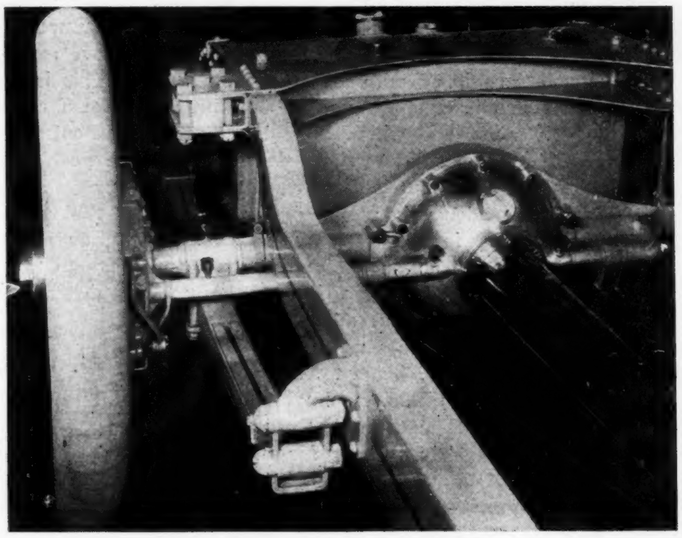
which has been mounting its springs in this manner for some 5 years. The principle advantages of such construction are due to the permissible lower hanging of the frame without decreasing the road clearance. This allows the center of gravity of the entire construction to be lowered somewhat and tends to make the machine more stable, reducing the side sway and causing the car to cling to the road better. Examples of the underslinging of both front and rear springs are the Franklin, Mitchell, Abbott-Detroit and the Stevens-Duryea. The Oakland models are also provided with underslung springs, both front and rear, on the four-cylinder models and in the rear only on the six. The new Garford model also has underslung rear springs.

Departures from the conventional flat type of American radiators are also seen this year. Several have adopted V-shaped construction, notably the Oakland, Knox and Chevrolet. This type of radiator is not new in Europe, although just beginning to appear in this country. It was utilized last year in the Abbott Bulldog, which is seen again at the Palace. The Jackson cars are also equipped with a new radiator, which is rounded, the resultant effect of greater cooling surface being the same as that obtained through the use of the pointed or V-shaped type.

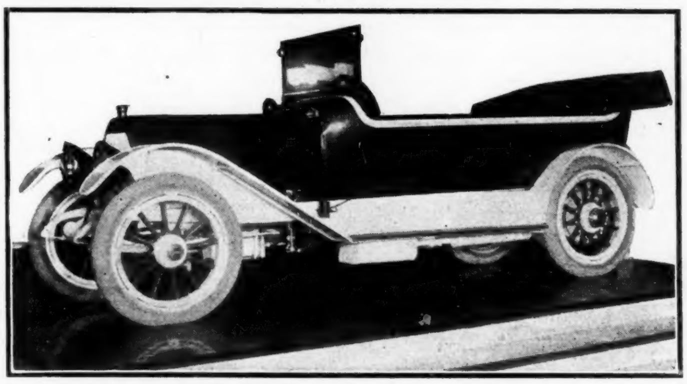
Taking up the question of drive and control, we find a number of concerns who have this year shifted to left drive, although the right-side driven car still appears to predominate. A list of the cars on the American market giving the drive is printed herewith and will serve to bring out the relative status of the various positions of the steering wheel. Only a few concerns make the drive optional with the purchaser of the car, these being the American, Knox, Moon, Pullman and several others. Among the makers at the show who are exhibiting entirely new models, the left drive is popular. Rather surprising was the appearance of all Packard models with left drive and control. When the little six Packard was brought out last fall with left drive and control it was the only machine of this make to be thus equipped, but now the Packard company announces complete change to this method of drive. On the other hand, the Peerless cars on which right or left drive was made optional last year have reverted to the use of right-hand drive exclusively.

The carrying of tires has been quite uniformly made a feature of the cars of the year in that special tire brackets are provided. In nearly every case the tires are carried at the rear on specially designed brackets, differing widely in construction. There are a few notable exceptions to this position of tire mounting, some concerns retaining the old placing on the running boards.

Wire wheels are gaining, if the number of cars so equipped at the show can be given as a criterion. One of the Stevens-Duryea cars is equipped with them, as well as one Premier model, a Haynes, a National, a Stutz and an Imperial. The price ranges

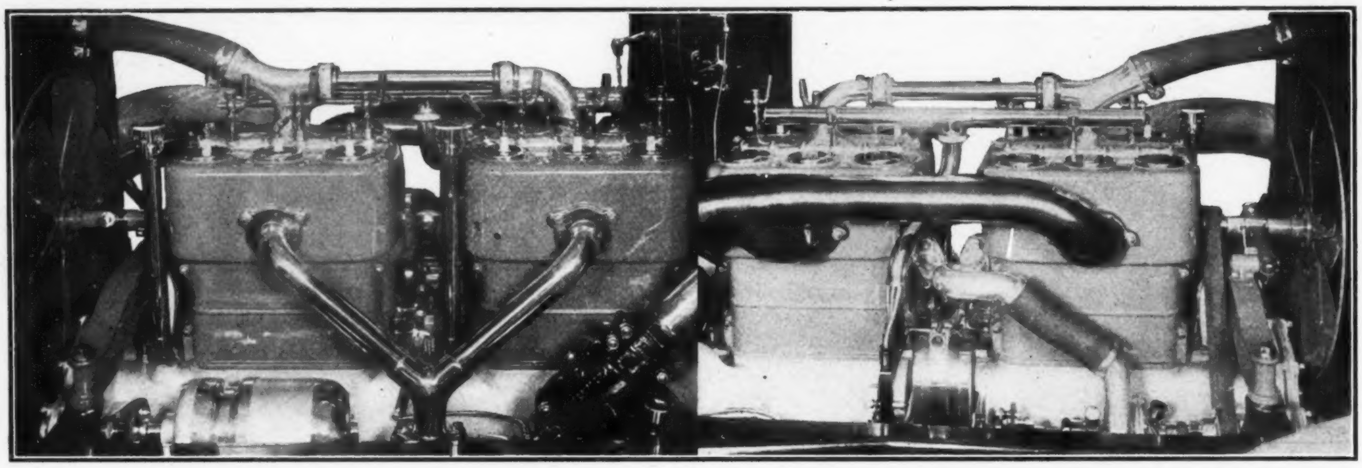


Three-quarter elliptic rear spring underslung on the new Garford six chassis



Owing to its small space the Alco showed but one model and mounted it on an elevated platform

from $125 to $200 extra for a set of five wheels, which are fitted with a demountable feature. Other companies which have adopted this wheel construction are the Keeton, Henderson, Pathfinder and Fiat. The increasing difficulty in the securing of first-class American hickory will no doubt in time work to the advantage of the wire wheel in this country. In the opinion of several exhibitors good hickory for spokes is rapidly becoming scarce and, consequently, too high in price. Hence the adoption of wire wheels is not far ahead.



Left—Intake side of the motor of the Little six, showing long Y-shaped intake manifold and mounting of electric starter, as well as substantial base of the steering column. Right—Chevrolet six motor, showing water connection between pump and cylinders

Transmission brakes have found very little favor in this country, although many of the European cars are provided with them, largely because their use is compulsory in several European countries, notably France. This year, however, we have one of our own cars equipped with a transmission brake. This is the National, which is equipped with a shoe bearing upon a collar on the driveshaft, and which is held out of engagement by a spring. This shoe is interconnected with the clutch pedal and when the latter is operated it is brought into play.

A growing tendency in motor design is that for the use of transverse shafts for driving magnetos and pumps, or pumps only. Such a construction allows the pump and magneto to be made very accessible from the sides of the motor, which constitutes one of the principal advantages. Among the makes of cars using cross-shafts are the Mitchell, Auburn, Marion, Pope-Hartford, Studebaker, Imperial, Fiat and Velie. The Stevens-Duryea cars have a cross-driven shaft for the pump only located at the front of the motor. The driving of such transverse shafts takes several forms, as does the location of the shaft with respect to the motor. In some cases the drive is through worm and gear, while in others spiral gears are used. Often the cross-shaft passes through the crankcase somewhere around the mid position of the motor. Examples of this are the Imperial and the Marion. In the new Mitchells and Studebakers the shaft is placed forward of the motor between it and the radiator.

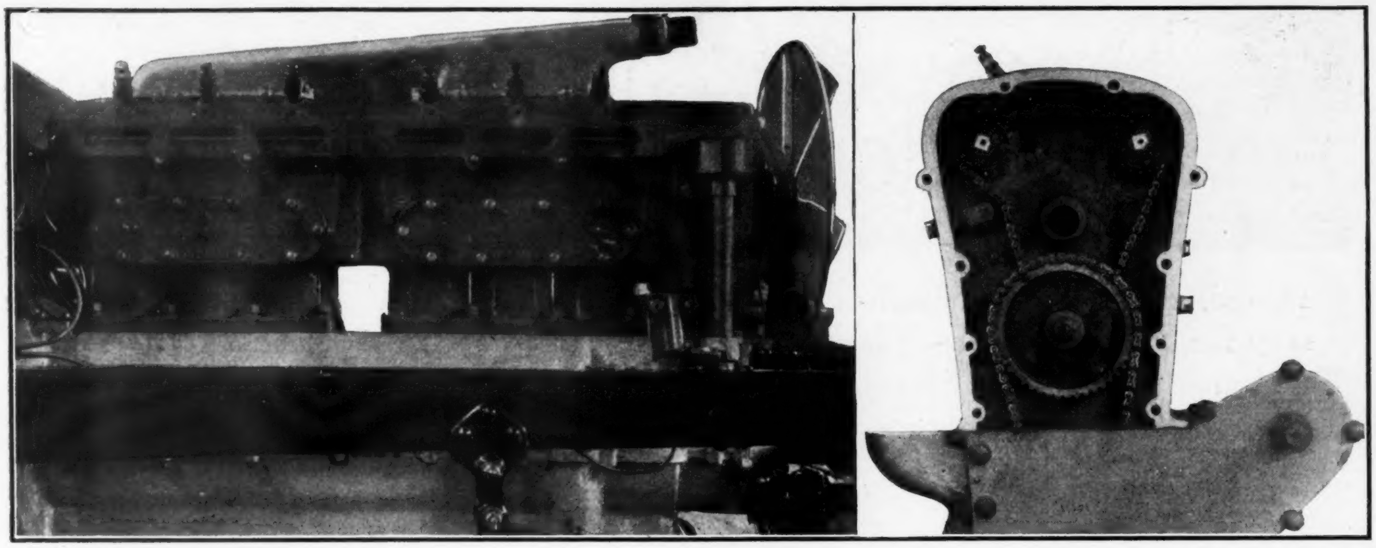
Dash gasoline tanks are also with us in several machines, among them being the Henderson, Hupmobile, Cartercar and Paige. The principal advantages of this location are that it allows for easy filling of the tank as well as permitting the mounting of the carbureter higher. This latter feature makes the carbureter more accessible. The disadvantage has been advanced that such a location of the gasoline tank increases the danger of explosion or fire should anything ignite in the vicinity of the power plant.

Silence has been striven for more than ever this year, as evidenced by the designs which are on view at Garden and Palace. Noisy brake rods, fenders which would in time work loose, and squeaking springs are tabooed. On the Mitchell, for instance, brake ribbons of steel carried on rollers replace brake rods as a silence feature. This construction is similar to that used on the Panhard cars. More universal housing of valve springs is found, which may again be traced to desire for silence. Accessible grease cups are provided on nearly every one of the new models, so that the oiling of springs and other parts is made a simple matter. Even the operation of the spark and throttle levers is made quieter.

All down the line refinements in detail in the accessories have kept pace with the general refinements in motor car construction. Magnetos are being made more compactly, and are rendered waterproof in many cases. Rear axles are made of better mate-

Lighting, Cranking and Ignition Equipment of 50 Models

Name of Car	Type of Starter	Make of Starter	Type of System, if Electric	What Electric Compon. Combined (if a 2 unit)	Make of Magneto if Separate	Make of Generator	Make of Starting Motor
Winton	Air	Own			Bosch	Optional	
Mitchell	Electric	Esterline	3		Bosch	Esterline	Esterline
Locomobile	Electric	G. & D.	3		Bosch	Adlake	G. & D.
Peerless	Electric	G. & D.	3		Bosch	G. & D.	G. & D.
Stevens-Duryea	Acetylene	Duryea			Bosch	Adlake	
Pope-Hartford	Electric	G. & D.	3		Bosch	G. & D.	G. & D.
Stearns	Electric	G. & D.	3		Mea	G. & D.	G. & D.
Franklin	Electric	Entz	2	Mo.-gen.	Bosch	Entz	Entz
Flanders	Electric	G. & D.	3		Splitdorf	G. & D.	G. & D.
Maxwell	Acetylene	Disco			Splitdorf		
Stoddard-Knight	Electric	G. & D.	3		Bosch	G. & D.	G. & D.
Stoddard 48	Electric	G. & D.	3		Bosch	G. & D.	G. & D.
Stoddard 38	None	None			Bosch		
Stoddard 30	None	None			Bosch		
Lozier Big Six	None				Bosch	G. & D.	
Lozier Light Six	Electric	G. & D.	3		Bosch	G. & D.	G. & D.
Olds Six	Electric	Delco	1	Mo.-gen.	Delco	Delco	Declo
Olds 4	None				Briggs	Stor.Bat.	
Overland 69	Electric	U.S.L.	2	Mo.-gen.	Bosch	U.S.L.	U.S.L.
Pierce	Air	Own			Bosch	Westingh.	
Chalmers	Air	Own			Splitdorf	G. & D.	
Reo	Electric	G. & D.	3		National	G. & D.	G. & D.
White	Electric	Own	2	Mo.-gen.	Mea	Own	Own
Oakland 6	Electric	Delco	1				
Hudson	Electric	Delco	1				
Packard	Electric	Delco	2	Mo.-gen.	Bosch	Delco	Delco
Buick	Acetylene	Disco			Remy	Vesta	
Cadillac	Electric	Delco	1		Delco	Delco	Declo
Cartercar	Electric	Jesco	2	Mo.-gen.	Briggs	Jesco	Jesco
Marmon	Electric	North East	2	Mo.-gen.	Bosch	North East	North East
Garford	Electric	U.S.L.	2	Mo.-gen.	Bosch	U.S.L.	U.S.L.
Columbia	Electric	G. & D.	3		Bosch	G. & D.	G. & D.
Moline	Electric	W.-Leon	3		Bosch	W.-Leon	W.-Leon.
Premier	Air	Own			Eisemann	Remy	
Pullman	Electric	North East	3	Mo.-gen.	Bosch	North East	North East
Alco	None				Bosch	G. & D.	
Jackson	Electric	Auto-Lite	3		Remy	Auto-Lite	Auto-Lite
Mercer	Electric	Rushmore	3		Bosch	Rushmore	Rushmore
Auburn	Electric	Electro	2	Mo.-gen.	Remy	Electro	Electro
Haynes	Electric	Luce-Nev.	3		Eisemann	Luce-Nev.	Luce-Nev.
S.G.V	None				Bosch	Stor-Bat.	
Cunningham	Electric	North East	2	Mo.-gen.	Bosch	North East	North East
Knox	Electric	Berdon	3		Bosch	Berdon	Berdon
Moon	Electric	Wagner	2	Mo.-gen.	Bosch	Wagner	Wagner
Matheson	Electric	Westingh.	2	Mo.-gen.	Bosch	Westingh.	Westingh.
Selden	Electric	G. & D.	3		Bosch	G. & D.	G. & D.
National	Electric	G. & D.	3		Bosch	G. & D.	G. & D.



Mead rotary valve motor. The side view shows the six ports or gas passages and there are six similar ones at the opposite side. The end view shows chain drive for the two rotary valves

rials and their gears are being cut with added accuracy and care in order to eliminate where physically possible chances of noise and failure. Steering gears have been refined and provided with more accessible points of lubrication and adjustment, so that the lay operator of the motor car will have no trouble keeping them in good condition. Lamps which are finished in any but nickel and black enamel are conspicuous by their absence, as were the former varieties several years ago. With the coming of electric lighting the compactness and general appearance and construction of lamps has been developed to the utmost.

The accessory exhibitors have duplicated their exhibits in some cases, that is, they have exhibits at both the Garden and the Palace. This is true of several of the tire people, one or two magneto makers and several in other lines.

Table Showing Status of Various Steering Wheel Positions on American Cars

Car	Left	Right	Center	Optional
Abbott-Detroit	0	2	0	0
Adams-Farwell	0	1	0	0
A. E. C.	1	1	0	0
Alco	0	1	0	0
Alpena	0	0	0	2
American	1	4	0	0
Ames	1	0	0	0
Apperson	0	3	0	0
Arbenz	1	0	0	0
Atlas	1	0	0	0
Auburn	0	5	0	0
Austin	3	0	0	0
Bergdoll	0	3	0	0
Buick	0	3	0	0
Burg	0	1	0	1
Cadillac	0	1	0	0
Cameron	0	4	0	0
Carhartt	0	2	0	0
Carroll	0	0	0	3
Cartercar	0	1	0	0
Case	0	2	0	0
Chadwick	0	2	0	0
Chalmers	0	3	0	0
Chevrolet	1	0	0	0
Cino	0	3	0	0
Coey	0	0	0	1
Colby	0	3	0	0
Cole	0	3	0	0
Columbia	0	2	0	0
Corbitt	0	1	0	0
Correja	1	4	0	0
Crane	0	1	0	0
Crow-Elkhart	0	6	0	0
Crawford	0	2	0	0
Croxton	2	0	0	0
Cunningham	1	0	0	0
Cutting	1	1	0	0
Diamond	0	1	0	0
Davis	0	2	0	0
Day	1	0	0	0
Detroiter	1	0	0	0
Dispatch	0	1	0	0
Dorris	0	1	0	0
Duryea	0	0	4	0
Duquesne	2	0	0	0
Edwards	1	0	0	0
Empire	0	1	0	0
Enger	0	2	0	0
Fal	0	1	0	0
Fiat	0	3	0	0
Firestone-Columbus	3	0	0	0
Flanders	1	1	0	0

Car	Left	Right	Center	Optional
Ford	1	0	0	0
Franklin	0	4	0	0
Garford	1	1	0	0
Gleason	0	1	0	0
Glide	1	1	0	0
Great Eagle	0	2	0	0
Great Southern	2	0	0	0
Great Western	0	1	0	0
Grout	0	2	0	0
Halladay	0	2	0	0
Havers	0	2	0	0
Haynes	2	1	0	0
Henderson	1	0	0	0
Herreshoff	2	0	0	0
Holly	1	0	0	0
Hudson	0	2	0	0
Hupmobile	0	2	1	0
Imperial	1	3	0	0
Inter-State	1	0	0	0
Jackson	0	3	0	0
Keeton	1	0	0	0
King	1	0	0	0
Kissel	0	4	0	0
Kline	0	4	0	0
Knox	0	2	0	2
Krit	1	0	0	0
Lambert	0	2	0	0
Lenox	2	0	0	0
Lexington	1	0	0	0
Lion	1	0	0	0
Little Four	1	1	0	0
Locomobile	0	3	0	0
Lozier	2	0	0	0
Luverne	1	0	0	0
Marathon	0	3	0	0
Marion	0	2	0	0
Marmon	2	0	0	0
Mason	0	2	0	0
Matheson	0	1	0	0
Maxwell	1	1	0	0
McFarlan	0	3	0	0
McIntyre	0	2	0	0
Mercer	0	2	0	0
Metz	1	0	0	0
Michigan	2	0	0	0
Midland	2	0	0	0
Miller	0	1	0	0
Mitchell	3	0	0	0
Moline	0	1	0	0
Moon	1	0	0	2
Morse	0	1	0	0
Motorette	0	1	0	0

Car	Left	Right	Center	Optional
Moyer	0	2	0	0
National	3	0	0	0
Norwalk	0	1	0	2
Nyberg	6	0	0	0
Oakland	0	3	0	0
Oldsmobile	0	1	0	0
Omaha	0	1	0	0
Only	0	1	0	0
Overland	0	2	0	0
Pacific Special	0	1	0	0
Packard	2	0	0	0
Paige	1	1	0	0
Palmer-Singer	0	2	0	0
Paterson	0	2	0	0
Pathfinder	0	1	0	0
Peerless	1	3	0	0
Perfex	0	1	0	0
Pierce-Arrow	0	3	0	0
Pilot	0	2	0	0
Pope-Hartford	0	3	0	0
Pratt	0	3	0	0
Premier	2	0	0	0
Pullman	0	3	0	1
Rambler	0	1	0	0
Rayfield	0	1	0	0
R. C. H.	1	0	0	0
Reeves, Sextoaut	0	1	0	0
Regal	0	3	0	0
Reo	1	0	0	0
Republic	1	1	0	0
Richmond	0	2	0	0
Schacht	1	0	0	0
Schlosser	0	1	0	0
Selden	0	1	0	0
S. G. V.	0	2	0	0
Simplex	0	4	0	0
Spaulding	1	0	0	0
Speedwell	1	0	0	0
Spoerer	0	2	0	0
Staver	2	3	0	0
Stearns	0	2	0	0
Stevens-Duryea	0	2	0	0
Stoddard-Dayton	1	3	0	0
Studebaker	0	5	0	0
Stutz	0	2	0	0
Touraine	0	3	0	0
Triumph	0	1	0	0
Velie	2	1	0	0
Warren	0	3	0	0
Westcott	0	2	0	0
White	3	0	0	0
Winton	0	1	0	0
Zimmerman	0	2	0	0

Digest of the Leading Foreign Journals

Standards Accepted by French Truck Makers and Exceptional Designs Found Necessary for Special Work—Mechanical Means for Adapting the Diesel System to Small High-Speed Motors and Getting Benefits of Cheap Universal Fuels

TRUCKS at Paris Show.—While the economical advantage of motor trucks is identified in the United States mainly with the amount of wages to drivers, attendants and stablemen which is saved for a given amount of transportation work and, in the large cities, with the very considerable real estate values which are released for other uses through the abandonment of horse stables, the more direct reduction of operating and maintenance cost which may be effected through attention to construction details occupies the minds of French commentators on the situation much more prominently. The mechanical efficiency of the machine is considered the indispensable basis which must be worked out in minute details first of all. This view has almost excluded the electric storage battery vehicle from consideration but, on the other hand, has led to the adoption of steam vehicles for certain forms of work, to the use of trailers and tractors, to the development of four-wheel driving and steering and to the resumption of electric transmission, with a view to certain well-defined classes of work for which the mechanical efficiency cannot be attained by the usual construction. A review of the situation from the French viewpoint is summarized in the following extract of an article by Duanier.

The difficulties of the past, may now be considered to have been overcome, judging from the showing made at the recent Paris Salon. They consisted mainly in four factors: (1) A mistaken tendency to exaggerated tonnage, which proved incompatible with the actual condition of roads and bridges and also held vehicles too long waiting for full loads and made running uneconomical with small loads; (2) the distrust and ignorance of the public; (3) the mistaken idea of competing with railroads rather than supplementing and extending their work, and (4) the working out of technical questions relating to proportions in power, capacity, speed, strength of organs, spring suspensions, wheels and tires.

Though the whole range from 2 to 5 tons capacity is economically available, the standard motor truck is the 3½ ton vehicle, because this size permits the loading of an ordinary European railway freight car in three trips and yet, when operated with less than full load or empty, is fairly economical, having a considerable advantage at the latter point over the 5-ton truck.

For delivery vehicles intended to run at a speed as high as 20 miles per hour and shod with pneumatic or cushion tires, the scale of weights and power which seems to be established calls for chassis weighing from 2,000 to 3,500 pounds, bodies weighing from 1,760 to 2,200 pounds, loads from 1,760 to 3,500 pounds and motors ranging from 12 to 20 horsepowers.

The two makes of heavy steam trucks intended for loads from 4 to 8 tons, which are the Exshaw (formerly the Purrey) of Bordeaux, and the Fodens, are used chiefly for the transportation of coal, cement and paper.

The only electric storage battery vehicles are the forecarriage trucks made by the F. R. A. M. company and used mainly for pulling municipal sweepers, sprinklers and garbage carts.

For the moving of loads up to 15 tons over roads of any grade encountered in practice, the tractor construction which has been developed depends for sufficient road adhesion upon the use of four driving-wheels, and a trailing vehicle serves to distribute the heavy load over a sufficient road surface. The lead in this development was taken by the Panhard company which at the beginning of 1912 introduced, for military purposes, a gasoline motor truck with four-wheel drive and four-wheel steering and said to have been designed by the Austrian archduke Salvator, [described and illustrated in these columns; see THE AUTOMOBILE, March 21, 1912]. At the Paris Salon there were shown two equally interesting constructions of the same order, the Latil motor tractor, Fig. 1, and the Balachowsky & Caire tractor with electric transmission, Fig. 2.

The Latil tractor-truck has six forward and two reverse gear speeds obtained by a three-speed gear box worked in conjunction with a double bevel gear upon the differential. A separate lever controls the bevel gears, engaging one or the other. [This expedient is not new but is perhaps improved in details, as compared with the form in which it first appeared in 1902 or 1901. —ED.] The vehicle has three differentials from two of which the wheels are driven through transverse cardan shafts. The main differential is located upon the gear box, and from it the two other differentials upon the axles are driven by fore-and-aft shafts and worm gears. As the four wheels take equal parts in the steering, one differential might have sufficed, but the use of three of them renders the vehicle much easier to handle on rough lumpy ground where the four wheels cover irregular individual distances. Among the reference letters in Fig. 1, A denotes the 24 horsepower 4-cylinder motor, B the gear box, C the central differential, DD the differentials of the two driving axles, E the steering gear, FF the brakes of the four wheels, H the cone clutch, II the worm gear shafts, KK the transverse cardan shafts, L the steering shaft, MM casings for the wheel-gears, O hook for attaching trailer, PP steering levers, R the radiator with the centrifugal ventilation now universally used in French trucks.

In the Balachowsky tractor-truck with electric transmission no clutch, gears or chains are used. The energy developed in the 4-cylinder gasoline motor is delivered to a flywheel-dynamo and from the latter by wiring to four motors in the wheels. Self-excitation of the dynamo—whose armature constitutes the motor flywheel—is obtained by a special arrangement the nature of which is not published but which involves neither the use of a storage battery nor of an independent exciter. Self-regulation is attained by creating a zone of compensating currents in the center of the armature by the action of which currents the flow of electromotive force is diminished the moment the amperage increases, and obversely, so that the power absorbed by the dynamo remains constant when the speed of the motor remains constant. The whole gamut of power development and utilization is thus regulated operatively by the throttle alone, and the speed of the vehicle is independent of the motor speed, regulating itself as a function of the motor power and the resistance to traction. A switch is sufficient for starting the vehicle, forward or backward.

In the very simple chassis resulting from this construction, as

shown in Fig. 2, *b* is the switch box, *c* the controller, *d* the dynamo-flywheel, d_1 the disconnector, d_2 the starter, *e* electric cables, *f* the hand-brake, f_1 brake levers, *k* trailer hooks, *m* the 4-cylinder gasoline motor, *r* the electric wheel-motors, *s* the muffler and *t* the brake drums.

These three types of four-wheel drive vehicles are intended largely for the work of transporting beets to the sugar refineries, for hauling stone and sand from quarries and pits, for hauling bricks and cement over the bad and steep roads usually found where these articles are made, for excavating and contracting work in general and, in the military field, for the engineering and artillery service, as for hauling siege ordnance and construction material for bridges. At recent maneuvers, one of them made it possible to transport a nine-inch siege mortar equipment, which was distributed in three trailer loads of four tons each, over ditches and ravines and to set it up in a plowed field.—From *Génie Civil,* December 21.

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PROSPECTS for Diesel Motors for Automobile Use.—The rapid adoption of the automobile for serious transportation work, upon whose continuance prosperity in peace and success in war may at any time come to depend, looks more and more like a leap in the dark, so long as nothing decisive has been done to make sure of the fuel supply. To all Europeans this shadow upon the development looks especially gloomy, as the doubling of the price demanded for gasoline derived from American petroleum has made it very clear that they are at the mercy not only of the limitations of the natural supply but also of the good will of a foreign nation and of speculators in that nation as well as in their own. The only other fuel of which it is known that it can be used in the existing automobile motors is benzol, which is a by product of cokeries and gas works and which now, since the demand for it has set in, threatens to rival gasoline in price. The mere chance that petroleum wells may be located in Africa and China from which a good fuel may be obtained gives only scant comfort. Much more promising is the chance of adapting the automobile motor to fuels which may be produced in any quantity in any country.

The Diesel motor is such an engine, for while it is at present operated mostly with the heavy residue of petroleum as a fuel because the supply thereof is still cheap and abundant—though rising in price—it is adapted for burning oil of coal tar with equal success and also any animal or vegetable oil. At present prices for heavy oil in Germany it can be operated at a fuel cost of 3 pfennig per horsepower-hour and at one-half of this cost where tar oil is a local product, while the same amount of work performed by an automobile motor with gasoline costing 45 pfennig per liter (about 40 cents per gallon) comes to 18 pfennig, being 6 times higher, and with benzol at the present price of 30 pfennig per liter, comes to 12 pfennig, or 4 times higher. Furthermore, the Diesel motor loses little in economy when adjusted down to half power or less, while the automobile motor loses heavily in fuel efficiency under the throttle, under which condition it is mostly used.

But the Diesel motor is very heavy and very costly, and it has never been operated successfully at much more than 550 revolutions per minute. These features completely unfit it for the automobile. The question is whether they can be circumvented or not. Diesel himself has said that he is still working upon its adaptation to automobile work. An engineer, Otto Malms of Mannheim, discusses in a recently published article the possibilities for overcoming the great technical difficulties which stand in the way. These arise from (1) the very high compression and piston pressures which render a very substantial construction necessary, from (2) the need of measuring accurately very small amounts of fuel in a liquid state and carrying it to the injector valves in the same state with a frequency at least three times greater than that required in any regular stationary or marine Diesel motor, and (3) from the same necessity for combining accuracy, high speed and infinitesimal quantity in the injection and atomizing of the fuel.

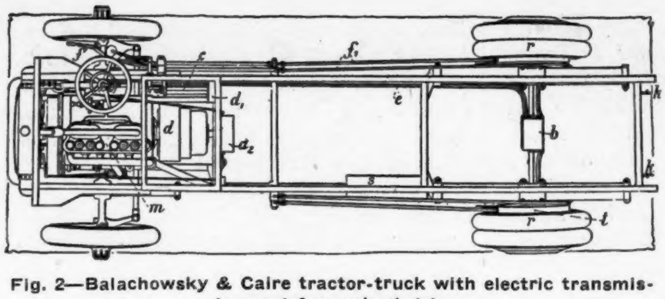


Fig. 2—Balachowsky & Caire tractor-truck with electric transmission and four-wheel drive

ONE PROBLEM ALREADY HALF SOLVED

The question of strength and weight does not seem half as formidable as it appeared a few years ago, as some of the latter-day automobile motors work with pressures of 25 to 30 atmospheres and the pressure in a small-sized Diesel motor does not usually exceed 35 atmospheres. Moreover, aviation motors are produced which sustain similar pressures at a weight of only 2 to 3 kilograms per horsepower, or less than one-half of what the advanced automobile motors weigh. It must therefore be assumed that the quality of materials and the art of incorporating them in the design of motors have already reached a point at which 35 atmospheres can be taken care of without notably increasing the present weight of automobile motors, their pistons, connecting-rods, crankshafts and camshaft mechanism. To be sure, the compressor plant for the injection of the fuel means an additional weight, but on the other hand the weight of the magneto and the carbureter is saved.

THE PRINCIPAL PRACTICAL DIFFICULTY

The operation of a Diesel motor depends absolutely upon having a strictly measured amount of liquid fuel dosed into the injector nozzle of each cylinder preceding each combustion stroke and to be deposited there in a liquid state ready to be blown into the cylinder by the use of compressed air at the beginning of the stroke and during a portion of its duration. These small fuel doses must be reduced exactly in proportion if the load of the motor is reduced. When the motor runs idle they should be about one-fourth as large as at full load.

The quantities to be measured in this manner in an automobile motor of fairly high speed would be exceedingly small and would have to be delivered up to 700 to 750 times per minute for each cylinder in the case of a four-cycle motor and twice as rapidly if the two-cycle system were adopted, as it now usually is in Diesel motors for use in boats and ships. A simple calculation, based on burning 10 liters of fuel per hour in a 40 horsepower motor of 4 inch bore and 5¼ inch stroke, shows that the dose to be delivered at each action would involve only a stroke of 3.1 millimeters of

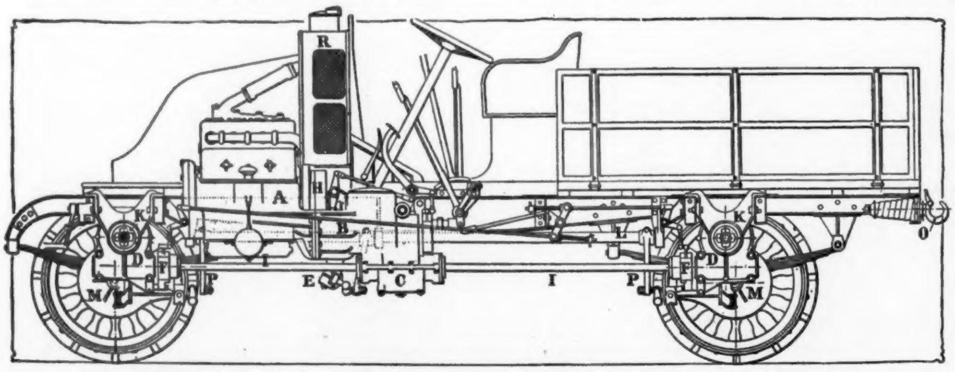


Fig. 1—The Latil tractor-truck with four-wheel driving and steering

a pump piston 5 millimeters in diameter at full power of the motor; and with the motor running idle the pump stroke could be only 0.8 millimeter long. Such miniature work and workmanship are scarcely practicable. In ordinary Diesel motors of much larger size the pumps are made to handle a 3 times larger quantity of fuel at each stroke than that momentarily required and a provision is made for returning each time from 2/3 to 11/12 thereof to the suction pipe, but even with this system of differential pumping the quantities to be handled in an automobile motor would be far too small. In other words the fuel pumps of Diesel motors have to be redesigned for automobile purposes.

A number of methods may be imagined and have been more or less seriously proposed or even tried, but in each of them some difficulty crops out upon closer investigation. Fig. 3 indicates, for example, a method which seems very plausible, and the feature of the open nozzle which is incorporated in it and which also is used in most of the modern stationary Diesel motors seems in fact indispensable for any high-speed automobile Diesel motor, as it admits of introducing the fuel against low pressure rather than against the 50 to 60 atmospheres of the air compressor and also renders it possible to use the pressure air at a higher temperature, so that special cooling of it becomes unnecessary.

According to Fig. 3 the fuel is kept in a tank under constant but low pressure and is admitted through the needle valve *n* into the nozzle *d* during the suction stroke of the motor when the resistance is small. The needle valve is controlled by the cam *o*, and by the use of a slidable oblique cam the time during which the valve is kept open—the stroke of its needle—may be adjusted to correspond with variations of the motor load. Certain measured amounts of fuel may thus be introduced if only the pressure in the fuel tank is kept constant, and this may easily be done by means of an air pump with a certain amount of dead space.

The fatal objection to the arrangement is that, when the amount of fuel introduced in the open nozzle depends upon the time during which the valve is open, it also thereby depends upon the speed of the motor, while the size of each dose should depend upon the load of the motor.

ONE SOLUTION OF THE FUEL FEED PROBLEM

Figs. 4 and 5 show sketches of an arrangement promising results more in accordance with the requirements. It is meant to sustain a pressure upon the fuel supply proportionate to the power requirement at any moment. The arrangement is not proposed as final but as one showing that the problem can be practically solved. It is assumed that piston pumps should be used, since rotary pumps are less positive and more efficient at high than at low speed, while the requirement is exact measurement independently of the speed. It is also assumed that these piston pumps should be of such a size that they can be practically manufactured and operated. To this end each pump stroke is arranged to furnish fuel for more than one combustion, the pumps being geared down to run much slower than the motor. To get a perfectly constant stream of fuel, two pump pistons may be driven from two cams n_1 and n_2 so shaped that the two pressure strokes blend into a perfect continuity, and the distribution to the four nozzles of the four motor cylinders can be made on the plan shown in Fig. 3, using one positively operated admission valve for each cylinder nozzle, and these valves may, under the varying fuel pressure, always be worked with the same stroke of the needle valve and the same duration of the fuel admission.

In order to reduce the fuel admission when this is required, the cams may be made laterally displaceable and oblique of conformation. It may be a mechanical task to shape such cams properly in the first place, considering that at any adjustment they should produce a perfectly measured pressure-flow of the fuel [and it seems that it would be necessary to provide a spring-resistance to this fuel pressure, and possibly a safety valve, in the fuel receptacle from which it is fed to the valves and nozzles.—ED.] But, once made and tested out, it could be easily reproduced in a milling machine.

Fig. 5 illustrates how a pair of cams cut on curves of the Archimedean spiral may be designed so as to produce for any one-sixteenth of a revolution of the camshaft the same amount of advancement in the pressure stroke of one or the other of the two pistons. The actions of the two pistons can also be made to overlap.

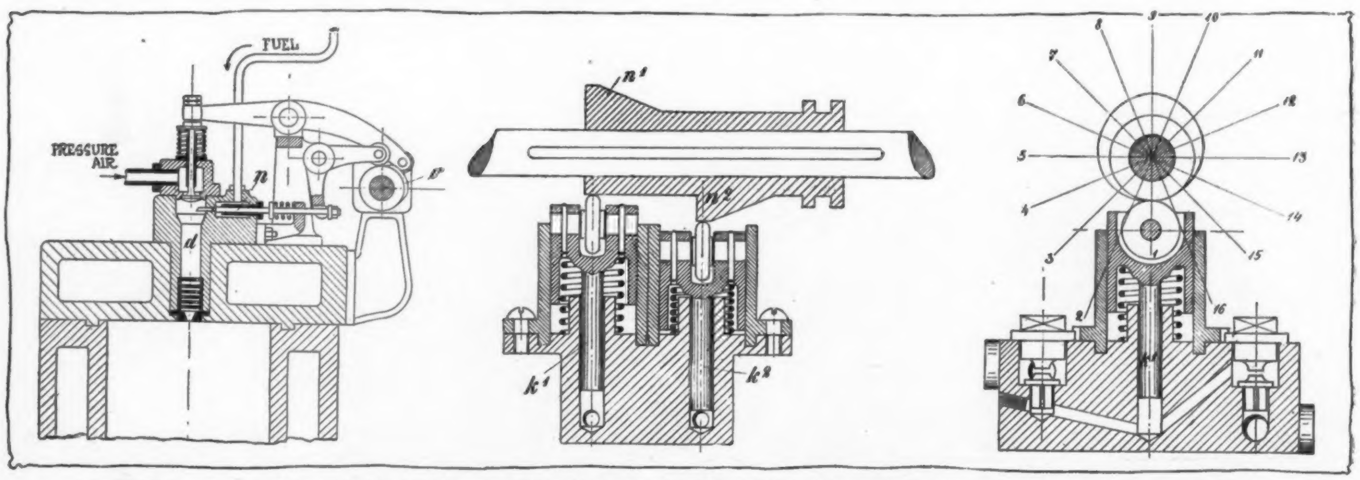
With this style of fuel feed, the same size of pump can be made for different sizes of motors, the pumps being driven with a greater speed reduction the smaller the motor is.

How the difficulties relating to the injection of the fuel into the cylinders by means of compressed air may be overcome forms the subject of another chapter.—From *Allgemeine Automobil Zeitung*, December 18 and 20.

"Solid Air" is the taking name of a new tire-filling substance which according to the reports from the Paris Salon can be injected in tires at different tensions, to correspond with the weight and normal load of the vehicle as well as the size of the tire casing. Injected in a liquid state it becomes plastic in a few hours and generates occluded gas in millions of cells. It is said to be compressible and inextensible, while rubber is incompressible but extensible.—From *L'Auto*, December 21.

Neat Metal Foot Boards are taking the place of wooden ones in some English cars. Nazarro, in his Italian car, shows an inclined metal dashboard of rare elegance.

Inside Twin Tire.—At the stand of J. Faure at the Paris Salon means were shown for adding a twin tire on the inner side of a wheel. A better mechanical makeshift—where there is room for it—than adding it on the outer side!



Figs. 4, 5 and 6—Details in the reconstruction of the Diesel fuel feed system for use in automobile motors

Stroke vs Bore

America . . . 1.22
France 1.65
Gt. Britain . . 1.43

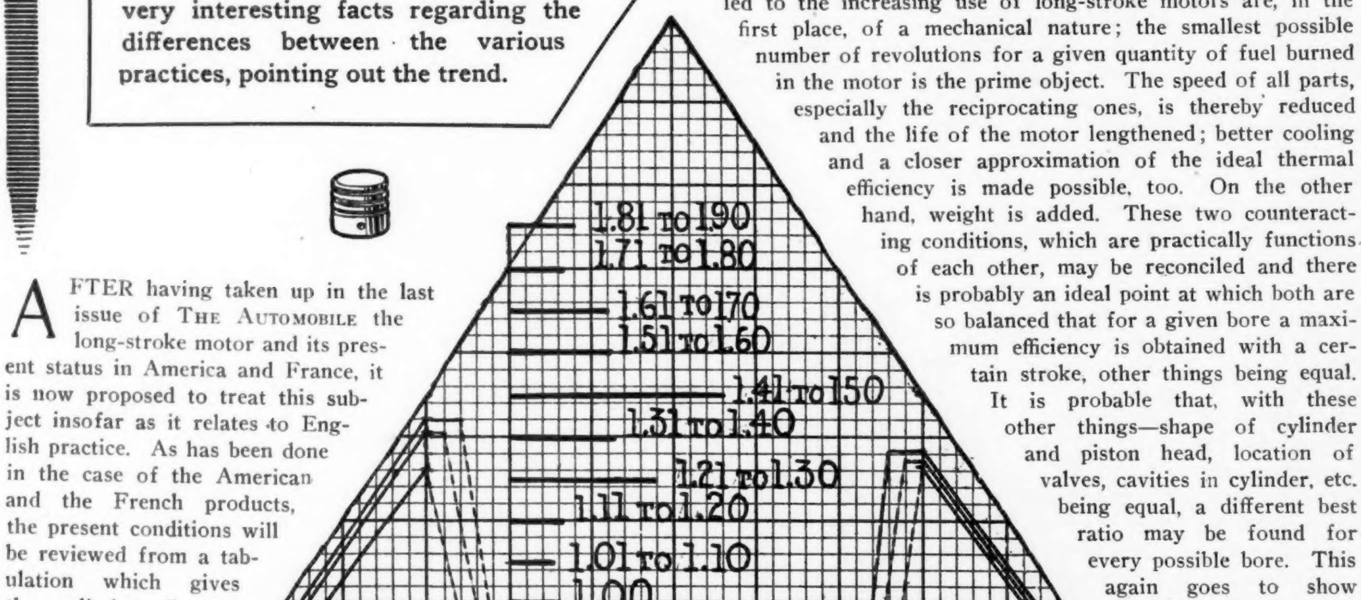
Installment II

¶ The English motors, which range in average stroke-bore ratio between the American and French averages, are reviewed in this article and the British situation is compared to those obtaining in the United States and on the continent.

¶ This comparison brings out some very interesting facts regarding the differences between the various practices, pointing out the trend.

AFTER having taken up in the last issue of THE AUTOMOBILE the long-stroke motor and its present status in America and France, it is now proposed to treat this subject insofar as it relates to English practice. As has been done in the case of the American and the French products, the present conditions will be reviewed from a tabulation which gives the cylinder dimensions and their ratios, and these conditions will then be compared to those obtaining in the 2 preceding years. This process shows that during each of the past 3 years England stood midway between France and America in respect of the average stroke-bore ratio, and that this ratio has risen constantly during this time and at a rate practically parallel to that of the increase in French and American motors.

Remembering that this article takes into consideration only the stroke-bore ratio in general, as well as particular and striking instances, the reader should not attempt to draw too bold conclusions from the subject of the article. The subject of horsepower, which is more closely related to piston displacement than to anything else, is beyond the scope of this review, and there is every reason for this being so. The considerations which have led to the increasing use of long-stroke motors are, in the first place, of a mechanical nature; the smallest possible number of revolutions for a given quantity of fuel burned in the motor is the prime object. The speed of all parts, especially the reciprocating ones, is thereby reduced and the life of the motor lengthened; better cooling and a closer approximation of the ideal thermal efficiency is made possible, too. On the other hand, weight is added. These two counteracting conditions, which are practically functions of each other, may be reconciled and there is probably an ideal point at which both are so balanced that for a given bore a maximum efficiency is obtained with a certain stroke, other things being equal. It is probable that, with these other things—shape of cylinder and piston head, location of valves, cavities in cylinder, etc. being equal, a different best ratio may be found for every possible bore. This again goes to show that the highest stroke-bore ratio must not necessarily be an indication of ideal efficiency of the gasoline motor.



Stroke-bore ratios of English motors for the past 3 years, showing its constant increase, and in center classification of motors by ratios

The 1913 list of English motors shows a total of 114 motors of which ninety-two are fours and twenty-two sixes, corresponding to percentages of 80.5 and 19.5. This compares with 1912 as follows: In that year there were eighty-six fours and twenty-three sixes or 78.9 and 21.1 per cent. respectively, making a total of 109 power plants. In 1911 there were eighty-seven motors of which seventy-one were fours and sixteen sixes, the percentages being 81.6 and 18.4 respectively. The ratios of fours and sixes during the past 3 years were as follows:

	1911	1912	1913
Four cylinder	1.32	1.41	1.44
Six cylinder	1.33	1.34	1.37

The following tabulation shows the distribution of English 1913, four and six-cylinder motors classified by their stroke bore ratios:

Ratio	Fours	Sixes	Total
1.01 to 1.10	4	1	5
1.11 to 1.20	6	..	6
1.21 to 1.30	15	3	18
1.31 to 1.40	11	2	13
1.41 to 1.50	17	9	26
1.51 to 1.60	11	1	12
1.61 to 1.70	11	1	12
1.71 to 1.80	5	1	6
1.81 to 1.90	7	..	7
Square motors	3	3	6
Short stroke	2	..	2
Totals	92	22	114

The greatest number of motors have a ratio between 1.41 and 1.50 and the average would be about 1.45 were it not for the fact that the bore-stroke ratios below 1.40:1 outnumber by far the motors having a greater ratio than 1.50:1.

As the accompanying tabulation of the bore and stroke ratios for the past 3 years shows, the leaders for 1913 are found among the four-cylinder designs, the greatest ratio being 1.88:1. This is the ratio of the Belsize, of the smallest bore. The same ratio is used in the larger Calthorpe, the little Humber and the larger Vulcan model. Then follows one each of the Star and Sunbeam cars with a ratio of 1.87:1, the next highest in the line being the second Calthorpe, 1.81:1. Without quoting any further high ratios which may be seen upon examining the tabulation, attention is called to the peculiar manner in which the great majority of British cars range within narrow limits of ratio, thereby differing considerably from American practice, in which a relatively high percentage of motors is distributed through a ratio range from 1.00 to 1.50:1.

Among the sixes the larger Daimler car leads with a ratio of 1.75:1 and its closest follower is the Armstrong, 1.67:1, next to which ranks the small Napier, 1.55:1. While there are no short stroke designs among the 1913 sixes, three square motors or 13.7 per cent. of the total of twenty-two motors, show that the conservative idea of a relatively short stroke is still alive.

Twenty-one out of the ninety-two four-cylinder motors have greater ratios than last year's product of the same make and twelve motors have smaller ratios, corresponding to 23 and 13 per cent. of the total, respectively. Among the sixes there are four increases of ratio and one case of decrease, or 18 and 4.5 per cent. respectively.

The greatest gain in ratio among the four-cylinder designs is that of the Star which has a ratio of 1.67:1, this being 25 per cent. in excess of last year. Next is the Humber, fourth of its name in the tabulation, the ratio of which has been increased 23 per cent. since 1912. The third Argyll has a ratio 18 per cent. larger than last year. Britton and B. S. A. have each increased their ratios by 15 per cent., the third Armstrong by 12 per cent., the Enfield has gained 13 per cent. and there are a number of designs which have been enlarged in their ratios by less than 10 per cent. The largest decrease is that of the Argyll appearing as the second of its name in the tabulation, namely, 32 per cent. The Austin, with a decrease of 16 per cent. is second, the Clement third with 11 per cent., and the Straker fourth with 6.5 per cent.

In the six-cylinder class the larger Daimler leads with a ratio increase of 46 per cent. against last year. The other increases of ratio are comparatively insignificant, the Armstrong being second with a gain of 11.4 per cent. and the Vauxhall third, with 4.5 per cent. The Sunbeam is the only case of lessened ratio, this year's being 10 per cent. smaller than that of 1912.

If we consider the meaning of these

Stroke-Bore Ratio of Four-Cylinder English Motors

NAME	1911			1912			1913		
	Bore	Stroke	Ratio	Bore	Stroke	Ratio	Bore	Stroke	Ratio
Aberdonia	....	....	....	3.50	5.00	1.43	3.50	5.00	1.43
Adams	3.35	4.74	1.42	3.46	4.72	1.37	3.46	4.72	1.37
Albion	4.88	5.00	1.02	3.13	5.00	1.60	3.11	5.00	1.61
Alldays	....	....	....	....	....	....	3.35	4.25	1.27
Alldays	3.38	4.49	1.34	3.39	4.29	1.25	3.39	4.29	1.25
Alldavs	....	....	....	3.94	5.12	1.30	3.98	5.12	1.29
Argyll	....	....	....	4.00	5.13	1.28	3.98	5.12	1.29
Argyll	3.15	4.72	1.50	3.56	5.50	1.55	3.15	4.72	1.50
Argyll	2.83	4.72	1.67	2.81	3.94	1.42	2.83	4.72	1.67
Armstrong	3.94	4.72	1.20	3.75	4.72	1.25	3.94	4.17	1.20
Armstrong	3.15	4.72	1.50	3.15	4.72	1.50	3.51	5.31	1.68
Armstrong	3.35	4.72	1.41	3.56	5.31	1.49	3.35	5.31	1.58
Arrol-Johnston	....	....	....	2.72	4.72	1.74	2.72	4.72	1.74
Arrol-Johnston	3.15	4.72	1.50	3.15	5.51	1.75	3.15	5.31	1.68
Austin	3.50	4.49	1.28	3.50	4.52	1.29	3.50	4.52	1.29
Austin	4.38	5.00	1.14	4.38	5.00	1.14	4.33	5.00	1.16
Austin	2.99	4.33	1.45	2.50	3.50	1.40	2.99	3.50	1.18
Baguley	....	....	....	3.54	5.12	1.45	3.54	5.12	1.45
Bell	3.98	5.51	1.39	4.01	5.51	1.38	3.98	5.51	1.39
Bell	3.54	4.72	1.33	3.58	4.72	1.32	3.54	4.72	1.33
Bell	4.53	5.90	1.30	4.53	5.90	1.30	4.60	5.90	1.29
Belsize	....	....	....	2.72	5.12	1.88	2.72	5.12	1.88
Belsize	3.54	4.72	1.33	3.66	4.72	1.29	3.70	4.76	1.29
Bentall	3.94	3.74	.98	3.94	3.74	.98	3.94	3.74	.98
Briton	3.54	4.72	1.33	3.54	4.72	1.33	2.95	4.49	1.53
B. S. A	3.54	4.72	1.33	3.54	4.72	1.33	2.95	4.49	1.53
Calthorpe	3.54	4.72	1.33	3.15	5.90	1.88	3.15	5.90	1.88
Calthorpe	3.95	5.11	1.73	2.72	4.92	1.81	2.72	4.92	1.81
Chambers	3.38	3.98	1.18	3.38	3.98	1.18	3.38	3.98	1.18
Clement	4.01	4.37	1.09	4.21	5.12	1.32	4.21	5.12	1.32
Clement	3.15	4.72	1.50	3.35	4.72	1.41	3.74	4.72	1.26
Clement-Talbot	3.15	4.72	1.50	3.15	4.72	1.50	3.15	4.72	1.50
Clement-Talbot	3.98	4.49	1.13	4.00	5.50	1.37	3.98	5.51	1.39
Crossley	4.02	5.51	1.37	4.02	5.51	1.37	3.97	5.51	1.39
Crossley	3.11	4.72	1.52	3.15	4.72	1.50	3.11	4.72	1.52
Crowdy	5.00	5.51	1.10	5.00	5.51	1.10	5.00	5.51	1.10
Daimler	4.88	5.12	1.05	4.88	5.12	1.05	4.88	5.12	1.05
Daimler	....	....	....	3.54	5.12	1.45	3.54	5.12	1.45
Daimler	3.98	5.12	1.29	3.98	5.51	1.39	3.98	5.51	1.39
Daimler	3.15	5.12	1.63	3.15	5.12	1.63	3.15	5.12	1.63
Deasy	2.95	4.33	1.47	2.95	4.33	1.47	2.95	4.49	1.52
Deasy	3.15	5.12	1.62	3.15	5.12	1.62	3.15	5.12	1.62
Deasy-Knight	3.54	5.12	1.45	3.54	5.12	1.45	3.54	5.12	1.45
Dennis	3.54	4.33	1.22	3.54	5.12	1.45	3.54	5.12	1.45
Dennis	....	....	....	....	....	....	3.15	5.12	1.62
Dennis	3.94	5.09	1.29	3.94	5.12	1.30	3.94	5.12	1.30
Dodson	3.15	4.72	1.50	3.15	4.72	1.50	3.15	4.72	1.50
Dodson	3.93	5.51	1.40	3.93	5.51	1.40	3.93	5.51	1.40
Enfield	3.94	4.53	1.15	3.94	4.53	1.15	3.94	5.12	1.30
Enfield	2.95	3.94	1.34	2.99	4.72	1.58	2.99	4.72	1.58
Enfield	3.38	4.25	1.26	3.38	4.25	1.26	3.38	4.25	1.26
Hillman	5.00	5.00	1.00	5.00	5.00	1.00	5.00	5.00	1.00
Hillman	3.50	3.78	1.08	3.50	4.33	1.24	3.50	4.33	1.24
Humber	....	....	....	2.68	4.72	1.76	2.72	5.12	1.88
Humber	....	....	....	3.54	4.72	1.33	3.54	4.72	1.33
Humber	....	....	....	4.13	5.51	1.33	4.13	5.51	1.33
Humber	....	....	....	3.07	4.33	1.41	2.95	5.12	1.74
Iris	3.15	4.49	1.43	3.15	4.49	1.43	3.15	4.49	1.43
Iris	4.25	5.24	1.23	4.25	5.24	1.23	4.25	5.24	1.23
Iris	5.00	5.24	1.05	5.00	5.24	1.05	5.00	5.24	1.05
Lanchester	4.02	4.02	1.00	4.02	4.02	1.00	3.98	3.98	1.00
Light Car	....	....	....	....	....	....	2.95	4.72	1.60
Maudslay	3.54	5.12	1.45	3.54	5.12	1.45	3.54	5.12	1.45
Napier	2.23	5.00	1.50	2.23	5.00	1.50	2.23	5.00	1.50
New Engine	4.49	4.49	1.00	4.49	4.49	1.00	4.49	4.49	1.00
New Engine	5.00	4.49	.90	5.00	4.49	.90	5.00	4.49	.90

figures we find that they indicate a slackening of the long-stroke tendency in English practice. This is true, despite the fact that the average stroke-bore ratio has increased 3 per cent. for 1912 and 4.4 per cent. for 1913, and that the rate of increase of long-stroke motors is seemingly the same, or approximately the same, as in America. The fact, however, that among thirty-nine British motors which have altered their stroke-bore ratio there are twenty-five, or 64 per cent., in which it has been increased, and fourteen, or 36 per cent., in which it has been decreased, indicates that English designers are traveling a different road from their American confreres. Of course, there are many long-stroke motors which have been continued without change from 1912 to 1913 and these serve to maintain the average of 1.43:1 for this year; but the fact that only twice as many makers have increased the ratio of their product than have decreased it is a strong indication of a change of mind on the part of English designers and engineers. This is so much more remarkable as French practice does not show any such change of tendency, but the long-stroke idea continues in favor.

It would be most interesting to study the circumstances which have brought about this change of pace on the part of the British manufacturer, but unfortunately this material is in the hands of the individual makers and is not accessible to outsiders. It may be expected, however, that the year 1913 will clear the situation and show whether this reversal of stroke-bore ratio development has been accidental or not, whether it was a step in a new direction or merely an attempt to go back to an engineering fashion of the past.

Nevertheless, an exact study of the tabulation of French motor dimensions and ratios as shown on page 78 of THE AUTOMOBILE for January 9 brings out the fact that England does not stand entirely alone in the retardation of the movement in the long-stroke direction.

The French motors which have what might be termed a long stroke, even in French eyes, that is 2.00:1 or more, have in most cases had this ratio during 1912, there being practically no creations of 1913 having such a high ratio. The tabulation mentioned above shows that 1913 has produced a very small number of new motors, among which there are only seven of a ratio of 2.00:1 or more. Still, the number of French motors having such ratios is more than twenty, so that hardly one-third of these long-stroke designs are products of the 1913 season.

American practice, on the other hand, does not indicate in any manner that it will follow the British designer on the path which he seems to have chosen. As has been shown in the first installment of this article, the American trend is very strong toward longer stroke and it might be reasoned that the optimum lies somewhere between the present ratios of England and France or is perhaps identical with the latter. This would explain the slower movement of English and French motor practice toward a high stroke-bore ratio. It is only reasonable to expect that when the advantages of long-stroke design are developed beyond a certain point they begin to make themselves felt as disadvantages or at least are not desirable for ordinary road work. The lengthening of the stroke with the continued use of a given bore naturally calls for either a higher center of gravity, or a wider crankcase and an increase of weight on the part of the latter or else an increase of the reciprocating mass in the motor. This increase of weight, if continued far enough, will offset the advantages derived from a long stroke, namely the lower angular velocity for a given piston speed. If this were not the case it would be very strange that so many French manufacturers who used a stroke-bore ratio of, say 2.04 in 1912 did not further increase it for 1913, although the Sizaire-Naudin car with its 2.48:1 ratio has had splendid success during the past 2 years, especially in racing practice. Furthermore, the fact that the ratio of the latter has been continued without change appears to be a silent way of admitting that the designer of this product has reached what he considers the limit in the long-stroke line.

Stroke-Bore Ratio of Four-Cylinder English Motors

NAME	1911			1912			1913		
	Bore	Stroke	Ratio	Bore	Stroke	Ratio	Bore	Stroke	Ratio
Pilot	3.54	4.72	1.73	2.56	4.33	1.69	2.56	4.33	1.69
Rothwell	3.11	5.00	1.61	3.11	5.00	1.61	3.15	5.00	1.59
Rothwell	3.91	5.00	1.28	4.02	5.00	1.24	3.98	5.00	1.26
Rover	3.78	5.12	1.36	3.54	5.12	1.45	3.54	5.12	1.45
Rover	3.35	4.33	1.29	2.95	5.12	1.74	2.95	5.12	1.74
Singer	3.54	5.12	1.45	3.54	5.12	1.45	3.54	5.12	1.45
Sirron	3.35	4.72	1.41	3.35	4.72	1.41	3.15	4.72	1.50
Sirron	....	....	....	....	....	....	3.15	5.00	1.59
Standard	3.50	4.25	1.21	3.11	4.72	1.52	3.11	4.72	1.52
Star	3.15	4.72	1.50	3.15	4.72	1.50	3.15	4.72	1.50
Star	3.50	5.51	1.57	3.15	5.90	1.87	3.15	5.90	1.87
Star	3.54	4.72	1.33	3.54	4.72	1.33	3.54	6.90	1.57
Straker	3.42	4.72	1.38	3.42	4.72	1.38	3.42	4.37	1.29
Sunbeam	....	....	....	3.54	6.30	1.78	3.54	6.30	1.78
Sunbeam	3.15	4.72	1.50	3.15	5.90	1.87	3.15	5.90	1.87
Swift	....	....	....	3.68	4.33	1.64	4.56	4.33	1.69
Swift	....	....	....	....	....	....	3.95	5.12	1.74
Swift	3.35	4.72	1.41	3.35	4.72	1.41	3.54	4.72	1.33
Thornycroft	3.98	4.49	1.13	3.98	4.49	1.13	3.98	4.49	1.13
Turner	....	....	....	2.95	4.72	1.60	2.71	4.33	1.60
Turner	....	....	....	2.36	3.94	1.67	2.36	3.94	1.67
Vauxhall	3.54	4.72	1.33	3.54	4.72	1.33	3.74	5.51	1.47
Vulcan	3.15	4.72	1.50	3.15	4.72	1.50	3.15	4.72	1.50
Vulcan	....	....	....	....	....	....	3.15	5.90	1.88
Wolseley	3.54	4.76	1.34	3.54	4.76	1.34	3.54	4.72	1.33
Wolseley	4.01	5.12	1.28	3.98	5.12	1.29	3.98	5.12	1.29

Stroke-Bore Ratio of Six-Cylinder English Motors

NAME	1911			1912			1913		
	Bore	Stroke	Ratio	Bore	Stroke	Ratio	Bore	Stroke	Ratio
Armstrong	....	....	....	3.54	5.31	1.50	3.54	5.90	1.67
Arrol-Johnston	3.15	4.72	1.50	3.15	4.72	1.50	3.15	4.72	1.50
Austin	4.37	5.00	1.50	4.33	5.00	1.25	4.33	5.00	1.25
Clement-Talbot	....	....	....	3.15	4.72	1.50	3.15	4.72	1.50
Daimler	3.98	5.12	1.29	3.98	5.12	1.29	3.98	5.51	1.75
Daimler	3.15	5.12	1.63	3.54	5.12	1.45	3.54	5.12	1.45
Deasy	....	....	....	3.54	5.12	1.45	3.54	5.12	1.45
Lanchester	4.02	4.02	1.00	4.02	4.02	1.00	3.97	3.97	1.00
Maudslay	....	....	....	3.54	5.12	1.45	3.54	5.12	1.45
Napier	5.00	5.00	1.00	5.00	5.00	1.00	5.00	5.00	1.00
Napier	4.02	5.00	1.25	4.02	5.00	1.25	4.02	5.00	1.25
Napier	3.23	5.00	1.55	3.25	5.00	1.55	3.23	5.00	1.55
Rolls-Royce	4.45	4.69	1.04	4.45	4.69	1.04	4.49	4.72	1.05
Sheffield-Simplex	3.35	5.00	1.49	3.50	5.00	1.43	3.50	5.00	1.43
Sheffield-Simplex	4.49	4.49	1.00	4.49	4.49	1.00	4.49	4.49	1.00
Star	....	....	....	3.15	4.72	1.50	3.15	4.72	1.50
Sunbeam	3.15	4.72	1.50	3.54	6.30	1.68	3.54	5.11	1.45
Vauxhall	3.54	4.72	1.33	3.54	4.72	1.33	3.74	4.72	1.39
Vulcan	3.15	4.72	1.50	3.54	4.72	1.33	3.54	4.72	1.33
Wolseley	3.54	5.12	1.45	3.54	5.12	1.45	3.54	5.12	1.45
Wolseley	4.49	5.75	1.28	4.49	5.75	1.28	4.49	5.75	1.28

Communications from The Manufacturer

J. A. Cleveland Finds Electric Truck About 50 Per Cent. Cheaper Than Horse and Wagon

THE evolution and rapid development of the automobile has been an important factor in facilitating the transaction of business and the transportation of merchandise within cities. The automobile has almost entirely supplanted the horse for ordinary pleasure and business service, and the automobile truck has begun to displace the dray and cart horse for commercial purposes.

As a result of this development in the automobile industry a great opportunity is presented to the central stations of the country for obtaining an important and valuable adjunct to their load, and from which they can derive an extremely profitable class of business. The electric vehicle is generally used during the day and evening and can be most conveniently charged during the night. This introduces a class of business which will use electrical energy during the very hours that the load upon the station is light. As a result, this business will tend to improve the daily load factor of the central station, and, furthermore, as the pleasure vehicles are used more in summer than in winter the business will improve the yearly load factor as well. The current used in charging is an off-peak load, coming on at the time of the lowest point in the load curve and requiring no increase in station investment. The load is one in which there are no fluctuations. As a current consumer the electric vehicle is decidedly attractive, the consumption varying as it does from 1,500 to 12.000 kilowatt-hours per car per annum.

The electrification of our city street railways marked an important step in the development of travel within cities and supplied the central station with an important consumer. The electrification of our city merchandise transportation system now presents another consumer of great possibilities. Commercial conditions are requiring a more rapid transfer of merchandise and in our larger cities the congestion of merchandise is becoming a serious problem. The electrical system applied to trucks offers advantages over the gasoline system in many respects. Electric motors are more simple in construction, and more durable and efficient in operation than the gasoline engine. Improvements in batteries during the past few years have greatly increased their efficiency. The speed of the electric truck is limited by the size of the motor and the number of cells in the batteries, and a check is thereby secured upon reckless driving which would result in disastrous accidents. Furthermore, the slower and more uniform speed prevents severe jolting of all parts of the machine and results in a lower maintenance cost.

Work for Central Stations

Opportunities are now offered to the central stations to help foster and develop the use of the electric vehicle and thereby secure for themselves an increased revenue. Inasmuch as this class of business is a non-peak load, special low rates are generally given. This increases the sales, but it has also been found to induce carelessness on the part of the consumer. This carelessness and excessive use of current results in frequent overcharging and ruining of the batteries. This practice will tend to cause dissatisfaction and will result in retarding the increase in use of electric vehicles. It is therefore evident that the central station must lend its assistance in educating the people regarding the proper methods to be used in charging the batteries, as well as handling the machine, in so far, as the electrical equipment is concerned. A number of central stations in the larger cities employ a man especially for this purpose, and his services are available to the public without any charge. This is, of course, impracticable except in large cities, but every company usually has some electrical employee possessing more or less knowledge in regard to the operation and care of electric vehicles and he could with some assistance and help increase his knowledge so that he would be of assistance to the public in this connection. The successful introduction and wide use of these vehicles depends upon the education of the public in their proper application and care. An educational campaign and some expert assistance is needed so that the vehicles used may be adopted to the purpose and service demanded of them. This business demands the same care and attention as is given to the prospective power user in recommending to him the proper type and size of motor adapted to his needs, and to the merchant in explaining to him the best system of illumination to adopt.

The aim of the central station being to help increase and develop this class of business, it naturally follows that the company itself should be among the first to utilize the service. Instead of using line wagons, repair wagons and meter wagons, it should use electric trucks for these purposes. In addition to thus daily advertising this service, the company itself can increase the efficiency of its own organization.

Actual Daily Truck Record Kept

In Saginaw the companies now have two electric trucks in daily use, one a 1,000-pound gas company truck as a meter and service truck, and the other, a 2,000-pound truck, used by the power company as a service and line repair truck. These trucks were purchased during the past summer from the Argo Electric Vehicle Company, of Saginaw, and have given most satisfactory service under all conditions. The smaller truck was put in operation June 12, 1911, and was used by the power company in connection with extensive pole and line work that was being done. Instead of purchasing an additional team and wagon, which would have been needed at this time, it was thought best to try an electric truck. It was found, however, that a 1,000-pound truck was too light for the heavy loads of wire and line material and later on a 2,000-pound truck was ordered and placed in operation in October. The smaller truck was then transferred to the gas company to be used as a meter and service truck, taking the place of two horses and wagons.

From the day the first truck was put in operation, a record was kept showing the number of miles traveled each day, and the actual number of hours and minutes each day that was spent in traveling as distinguished from the time that the truck was standing still while the men were at work at any one location, and the number of men each day that were employed upon the work.

The maintenance cost of the automobile truck was found to be greater than that of the horse and wagon, but the extra amount paid in wages in the case of horse and wagon operation still resulted in a saving of nearly 50 per cent. in operating costs by the use of the truck.

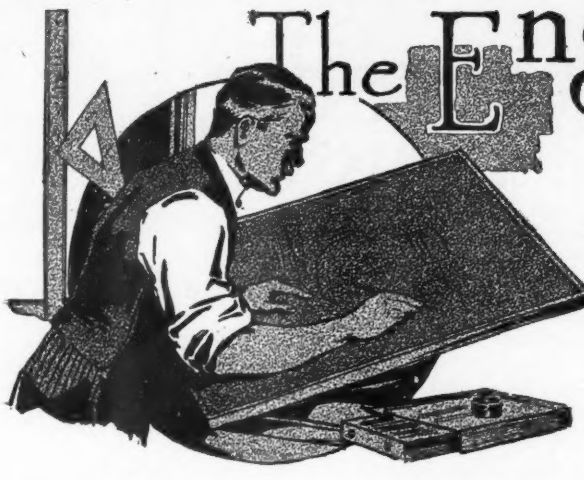
Our records show that the total yearly cost of the automobile truck is about 50 per cent. of the cost of the horse and wagon in doing the same work, which in our case means a yearly saving of nearly $1,000.

The following additional figures in regard to the operation of the truck during the period may be of interest:

Number days of truck operation	94	days
Number hours of truck operation	199.4	hours
Average number hours per day operation	2.12	hours
Total number of miles traveled	2009	miles
Average miles traveled per day	21.4	miles
Maximum miles traveled per day	53.5	miles
Average miles traveled per hour	10.08	miles
Total K.W.H. used	768	K.W.H.
K.W.H. used per day	8.17	K.W.H.
K.W.H. used per mile	0.38	K.W.H.
Energy cost per mile at 5 cents per K.W.H	$ .0190	
Battery renewal and repair cost per mile	.0314	
Mechanical repair cost per mile	.0090	
Tire renewal cost per mile	.0150	
Total operating cost per mile	.0744	
Total operating cost per day	$1.5900	

JOHN A. CLEVELAND, *Saginaw Power Company.*

The Engineers' Forum



3-Point vs. 4-Point

G. P. Dorris Likes 3-Point Type of Suspension—Would Like to See Return to Transmission Brake as Emergency Brake

ST. LOUIS, MO.—Editor THE AUTOMOBILE:—Noticing that another instalment of the discussion of three-point versus four-point suspension for motor and gearbox appeared in a recent issue of THE AUTOMOBILE, I herewith submit my views on the subject:

Use a rigid unit power plant, consisting of motor, clutch, transmission and electric systems. Mount this rigidly in a narrow or strangled frame, not to exceed 30 inches, permitting the swiveling of the front axle with the least torsional strain on the frame.

Mount the rear of frame on three-point support platform springs, allowing the rear axle as much freedom as posssible, and the least torsional strain at the rear of the frame. This construction relieves the frame body and power plant of practically all torsional strains, and consequent squeaking and working of body and other ills.

For future argument, I would like to see a return to the transmission brake, as an emergency brake. It should be lever-operated, using the big external rear hub brake as the service brake, as is done in Europe. This system has the following advantages: Lighter rear axle and a smaller amount of unsprung weight.

Less overall weight eliminates the necessity of oiling the brake shafts and the chance of their rusting and seizing. A reduction of brake rods and equalizers eliminates chance of brake rattles—removes necessity of taking off rear wheels to adjust internal brakes. Single rear brakes alternated with transmission brake on long grades, gives divided and better radiation. The external rear brakes are directly accessible for adjustment.—G. P. DORRIS—Dorris Motor Car Company.

Favors Three-Point Suspension

DETROIT, MICH.—Editor THE AUTOMOBILE—I have read with great interest the discussion which has been carried on in the Engineers' Forum recently regarding the advantages and disadvantages of three-point and four-point suspension for motor and gearbox. As the Forum is apparently open to the readers of THE AUTOMOBILE for discussion of various points of engineering practice, I venture to submit my views on suspension.

The three-point type of suspension has always appealed to me for use in combination with a unit motor and gearbox. Some prefer mounting the motor unit on a subframe, but it seems to me that this is more suitable for the car with a big, heavy power plant than necessary for the smaller types in which the motor unit may be bolted to the frame side members while the forward end is fitted with a trunnion mounting. Of course, there should be different constructional factors taken into consideration depending on the weight of the power-plant, size of the car, flexibility of the frame, etc.

Where the motor and gearbox are separate, the rigid, four-point suspension for both is advisable, one of the principal advantages of this type of mounting under such conditions appearing to me to be the preservation of alignment. The firmness of both parts in position and the resulting durability constitute desirable features.

A number of manufacturers make the gearbox integral with the rear axle housing. It would naturally seem that in this type of construction the motor should be mounted in some form of three-point suspension. In this way the inequalities of the road would affect the forward part of the frame before reaching the rear portion where the gearbox is situated and thus the torsional strains which the frame would be called upon to stand would be lessened and distributed more evenly than where these strains fall all at once upon the forward end of a frame which has also to bear the weight of the entire power plant. This construction has other advantages, though it has also some disadvantages, for the added weight of the gearbox increases the strain upon the rear axle housing, etc. Taken all in all, it seems to work out satisfactorily in practice, however.

In the mounting of motor and gearbox on trucks there are different features to be considered, depending on the weight and size of the motor equipment and gearbox, their relative position, the space in which they are to be accommodated, etc.—J. F. BRANFORD.

Correction on Carburetion

In the article on Carburetion in the November 14 issue of THE AUTOMOBILE, page 1002, the specific heat of air should have given as 0.237 instead of 0.259 and the calorific value of the fuel at 288 British Thermal Units per pound, namely 9/5 × 160 calories. This makes:

$$\left.\begin{array}{ll} \text{Air} \ldots\ldots\ldots\ldots & 15 \times 0.237 = 3.6 \\ \text{Fuel} \ldots\ldots\ldots\ldots & 1 \times 0.500 = 0.5 \\ & \qquad\qquad\quad \overline{4.1} \end{array}\right\} \text{Temp. drop}$$

and for 160 calorie fuel 160 ÷ 4.1 = 39 deg. C.
for 288 British Thermal Units fuel 288 ÷ 4.1 = 70 deg. Fahr.

An Ingenious Danger Signal

LONDON, ENG.—A very interesting device was recently tested and examined by the authorities of Scotland Yard and of the home office in this country. The instrument is styled the Farometer, and it is a machine which has been designed and developed to register in large numbers on a prominent part of a motor-omnibus or taxi-cab the number of miles per hour the vehicle is traveling at any given moment, so that the public may see when a vehicle is exceeding the legal limit of 12 miles an hour in the case of the bus and 20 miles an hour for the taxi-while those carried on the vehicle, as well as the driver, are also shown the same figure. Should the vehicle pass the legal limit a gong sounds to draw the attention of the driver to the fact. If he persists in going faster a red flag appears. the machine being electrically illuminated at night.

Bad Roads Hurt Gearset—Peculiar Case of Short Circuit—Layout for Garage Addition—Sliding Universal Joint—Starting on Magneto System—Broken Connection in Coil Box—Reasons for Heavy Flywheels

Rough Roads Affect Transmission

EDITOR THE AUTOMOBILE:—As I am having trouble with my transmission, due to rough roads, I would like to know if this can be remedied to some extent by putting on wire wheels and larger tires.

2. What is the next larger size tire that can be put on a 3.5 by 34 rim?

3. Would a car equipped with 4 by 32 wheels in place of 3.5 by 34 climb the hills better and reduce speed on the level? Which tires would wear longer under a five-passenger 2,600-pound car?

4. The rear wheels of my car still have that cracking sound after having been tightened and kept in water. How could this be removed?

Glasco, N. Y. SUBSCRIBER.

—If your trouble is due to poor alignment of the drive shaft and gears, the fitting of wire wheels would not help you. The trouble might possibly be due to a loosening of the rivets connecting the gearset housing to the side members of the chassis. If this is the case it will be necessary to cut out the present rivets, ream the holes and re-rivet with larger rivets. Another trouble might be in the fact that the bearings on the gearset shafts are too far apart or are not of sufficient length or diameter.

2. The next size tire would be the 3.5 by 34 over-sized tire, which could be secured from most of the larger companies.

3. The difference in hill-climbing abilities would not be noticeable. The larger size tire would wear longer.

4. Any wheelwright should be able to remedy this trouble. The cracking sound is an indication of looseness or play in some part of the wheel. This looseness may be in the spokes or it may be in the felloe. Putting the wheel in water will tighten up the spokes for 1 or 2 days, and they will then dry out and be looser than they ever were. The only thing you can do is to take the wheel to a good wheelwright and have a permanent job made.

Short Circuit in Flanders Motor

Editor THE AUTOMOBILE:—I have a Flanders 20, 1910 model. Recently in endeavoring to start the car I threw out the clutch as usual in order to change the speed, and in so doing killed the engine just as though I had thrown off the switch. I have had the engine all down, ground the valves, adjusted the tappets, rewired with new wire and also had a new Stromberg carbureter put on. After having replaced and adjusted everything as nearly as possible, I tried again, with the same result. As long as the clutch is left in the motor runs very nicely, but as soon as you disengage it it stops.

Bloomington, Ill. J. E. CAMP.

—According to the service department of the Studebaker Corporation in New York City it occasionally happens that the spark control rod will be pushed against the breaker box of the magneto, causing a short circuit.

Plan for a Garage Addition

Editor THE AUTOMOBILE—I am looking for an up-to-date sketch or plan for an addition to my garage, which is 50 by 100. I want to add 50 by 100 with clear floorspace, upper floor to be used for paint shop, machine shop, vulcanizing and battery repair room.

Can you give me some light on this subject?

Waukesha, Wis. E. J. FOSTER.

—The best solution of your problem would be to construct, as you suggest, an upper floor on your present garage building. This floor would, of course, have to be 50 by 100 feet like the garage proper, and there should be no difficulty in so arranging the various shops on this floor as to arrive at a very efficient scheme. Since this floor is to be the highest in the building the proper location of windows and skylights to give suitable illumination for the painters and the repair work is a relatively easy thing. We would suggest the following arrangement for the departments which you want to install on this floor:

An elevator is required to bring automobiles from the street floor to the upper one, and it would be a happy idea to locate this elevator in the middle of one of the longer walls so that it projects as far as 20 feet from this wall and has a practically central position. The best place for the elevator would not be at the actual center of the building, but the installation should bear against one of the longer walls, preferably the back wall of the building. In front of the elevator there should be a 10-foot passage through which an automobile may be steered to either side of the floor. The paint shop might be advantageously located to one side of the elevator, giving it the full depth of 50 feet and a width of 40 feet. Two windows each on the front and rear side of the paint shop and three or four in the side wall of the building should give ample light and, if necessary, could be assisted by a 10 by 25-foot skylight.

Opposite to the elevator on the front side of the building a battery room 10 feet along the wall and extending 20 feet into the building should be located, being separated from the rest of the floor by a slidable wire door. Adjacent to the battery room should be a vulcanizing department 15 feet wide and 20 feet deep. This room, like the battery charging department, should have a wire door toward the passageway between it and the elevator. The rest of the floor, practically 1750 square feet, should be devoted to the repair shop, divided into three departments. A tool and stock room, in which small tools and a supply of the most necessary repair parts is kept, is 20 feet square and situated adjacent to the elevator, on the side opposite to the paint shop. A lockable door separates the tool room from the rest of the shop, the department next to it being the machine tool room, in which a lathe, planer, shaper, drill and arbor press and emery wheel should be stationed. This room should be 20 feet wide and should extend from the back wall 30 feet toward the front wall. This leaves a space of approximately 20 by 35 for the rest of the repair shop. In this room, benches ought to be arranged alongside the windows, and a useful addition to the

equipment would be a stand 4 feet above the ground and fitted with inclined runways on which an automobile may be moved up to the stand. This piece of equipment adds greatly to the ease of repair work and enables a man to do more work in a given time on a car with less fatigue than otherwise.

Depending on whether you think that this addition to your garage would be final or whether you expect to increase it again at some later date, the construction of the upper floor should be made lighter or more substantial. This point determines also the construction of the elevator shaft; if the upper floor will be the last addition to the building the elevator might open toward three sides of the room, being supported on structural beams positioned in the corners of the shaft; whereas if you expect to add another floor in the future only the front side of the elevator shaft should be open, the two sides being formed as walls, which aid in supporting an additional floor if the latter is built on the second story which you now intend to erect.

National Uses Sliding Universal Joint

Editor THE AUTOMOBILE:—Would you kindly tell me what type of universal joint is used on the National 40 car and what the different parts which go to make up this joint are named?

2. I have been troubled with a squeak from the worm and gear steering on my car, it is carried on ball bearings and I do not understand why it should give me this trouble. How can this be remedied?

Baltimore, Md. E. SUMMERFIELD.

—1. An illustration of this universal joint is given in Fig. 1. The upper shaded view shows the sliding portion while the lower view shows a large part of the assembly detail. The universal joint consists of a main steel portion attached to the gearset shaft by two keys. It revolves on the annular ball bearing shown in the illustration. The driving shaft is turned to a ball shape and has the hardened pin shown in both views running through it. Upon this pin work the two steel squares shown in the lower illustration. These slide within slots in the main portion of the joint and give the joint its name, sliding. A metallic housing incloses the joint and likewise a plentiful supply of grease for its lubrication.

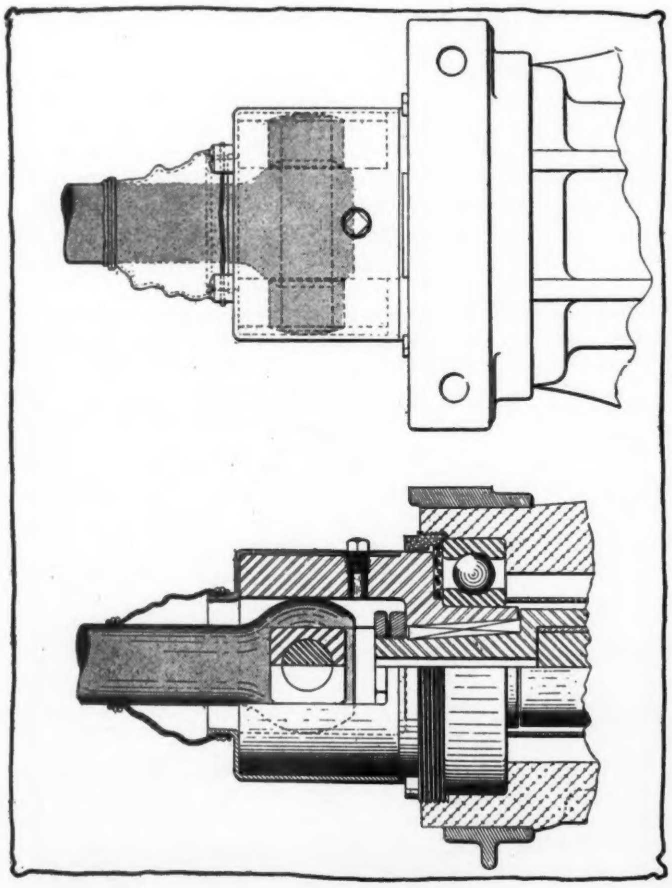


Fig. 1—National universal joint of the sliding type used on 40-horsepower cars

2. The squeaks in the steering gear are due to a lack of lubrication between the worm and the gear. If you will pack the gear housing with grease the trouble will be removed. The general arrangement of the parts is shown in Fig. 2.

Removing Chalmers Valve Caps

Editor THE AUTOMOBILE:—I have a Chalmers 36 and am about to grind the valves. Can you tell me how I can remove the valve caps? The instrument supplied with the car slips off when I begin to pull on it. I cannot start the caps with a cold chisel and hammer. Is there any wrench made that will fit these caps or can you tell me how I can have one made?

Salem, Mass. H. S. L.

—The New York agency has an extensive repair shop in which it repairs nothing but Chalmers cars. In this shop the method used for removing these caps is by placing a brass bar against them and hammering on the bar. The use of a cold chisel for this is bad because it will chip off the metal while the brass being softer will not harm it. It has been the experience of this shop that there are no valve caps which cannot be removed by this method, although some are much stiffer than others.

Weight of Flywheel Required

Editor THE AUTOMOBILE:—Can a six-cylinder motor be made with a flywheel of materially less weight than that used on a four-cylinder motor? Is it possible for an eight-cylinder motor to run without a flywheel? Why is it that a flywheel must be installed in a gasoline engine, and not on an electric motor? Is it because the revolving armature takes the place of the flywheel?

Philadelphia, Pa. L. F. RENBER.

—An increase in the number of cylinders lessens the necessity for a flywheel, but even with eight cylinders it is necessary to have some sort of rotating balancing member in order to get smoothness of action. With a single-cylinder motor the weights of flywheel used with automobile engines have run up as high as 1200 pounds, and in stationary motors the weight has gone far above this in order to get perfectly smooth action without jar when the motor is crossing dead center. In automobile practice flywheels on multi-cylinder motors are reduced for as small a size as possible and still secure even running, the greatest trouble being to secure a perfectly smooth action when crossing dead center under a heavy load causing the motor to turn over slowly. In average practice the flywheel on a four-cylinder motor of about 30 horsepower will average somewhere around 80 pounds. For a six-cylinder motor it will often be as low as 60 pounds, while motors with a flywheel of less weight than this have been made.

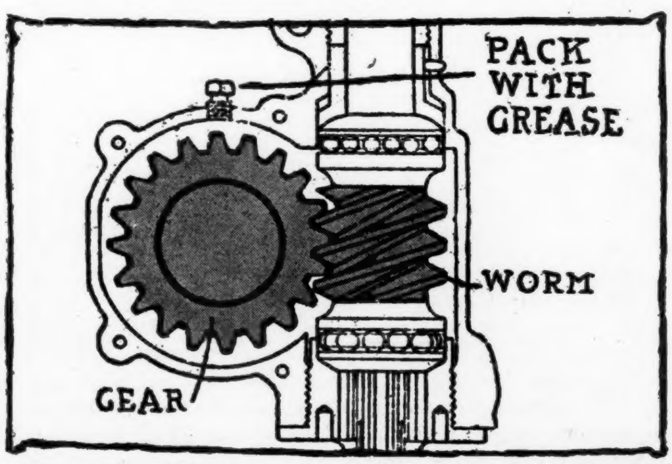


Fig. 2—Indicating point in worm and gear steering where grease should be applied

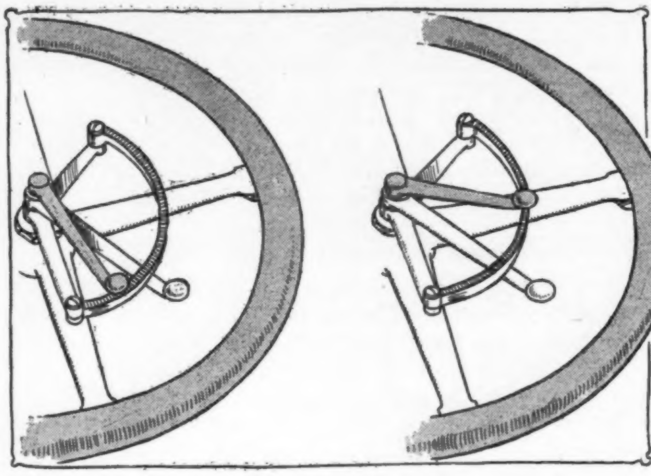


Fig. 3—Shaded levers show position of spark advance when started; left for battery, right for magneto

The weight of the flywheel required depends to a large extent on the balance of the machine itself as well as on the weight of the reciprocating parts and their distribution around the axes of the crankshaft. The reason a flywheel is not required on an electric motor is because the impulse is constant and there is no dead center over which the armature must be carried.

Curing Ford Clutch Trouble

Editor The Automobile—I have a Ford model T which has run about 6,500 miles, and wish to overhaul it.

1—The engine knocks, especially when pulling hard. Do you think this is due to carbon deposits in cylinder?

2—Do you think it necessary for the cylinders to be ground?

3—The clutch does not act as quickly as it should. I have tightened it, but that does no good. Is there any danger of having it too tight?

4—How many miles will the differential gear last in this make under good care?

5—Should this car run almost like new when overhauled?

Piqua, Ohio. M. O. F.

—1. The trouble evidently is in the fact that you have carbon in the cylinders. The carbon should be scraped from the cylinders and the valves ground.

2. If the valves have not been ground since you have had the car they are now probably in need of grinding.

3. The high speed adjustment should be tightened. The three set screws on the gear case should be given a one-half to a full turn, each screw being given the same adjustment.

4. This depends altogether on how the car is driven. Taking corners at high speed and otherwise abusing the car may materially shorten its life.

5. When thoroughly overhauled the car should run as good as new.

Starting on the Magneto

Editor The Automobile:—How is it when you wish to start on the magneto it is necessary to advance the spark lever from one-half to two-thirds the way on the quadrant? When this is done, where does the spark occur; before or after dead center?

2. Where does the spark occur when the spark lever is fully advanced?

3. What is the advantage of having cells (dry) in multiple series?

Boston, Mass. Subscriber.

—The reason that the spark lever must be advanced when using the magneto is because the lag of the spark is much greater in the magneto than in the battery. This is due not only to the actual lag of the magneto but also to the relative lag caused by the motor being turned over rapidly or spun when started on the magneto. The relative positions of the spark lever when starting by battery and magneto are shown in Fig. 3. The shaded levers in this illustration are the spark levers. The spark occurs at about dead center.

2. When the spark lever is fully advanced the spark occurs before dead center is reached. The maximum of advance is in the neighborhood of 35 degrees before dead center on the average touring car.

3. When the cells are connected in multiple series they last longer than if connected in series. So much current is contained in each cell and when these cells are increased in number a greater supply of current is available. When this supply is removed at the same rate or in other words when the same amount of current is consumed at the same time the greater number of batteries will last longest. Hence it is that a multiple series connected last longer than a single series.

To Find Gas Leaks in Motor

Editor The Automobile:—Could you tell me of a good method by which to locate the leaks in a gasoline motor. If the leak is very elusive I find that it cannot be exactly determined by the process of putting oil or soapy water on the different joints and connections, except by mere chance.

Chenango, Mich. Carl Spirone.

—First flush out each cylinder with about a pint of kerosene oil, after shutting off the gasoline from tank; then drain the crankcase to get the kerosene out of it. Now cut out the ignition, and be mighty careful you cut it out, or later, when you are pressing down on the starting crank, you may find a 30-40 horsepower kick which will most likely injure your arm if not break it. Close up tightly all priming cups, and on cylinder No. 1; take an oil can filled with kerosene and flood the plug from top to bottom, being sure to get enough oil in and around the base of the plug so that any escaping air will cause a bubble to appear when you tnrn the engine over its compression. Be sure you put the kerosene around the priming cup also, for these leak a trifle at times where they are seated, and any leak, however small, will cause trouble in the proper running of the motor. After you use the oil, take the starting crank and press it slowly downwards, at the same time watching carefully the cylinder and priming cup for any air bubbles which may appear. Repeat until all cylinders are tested, being careful not to skip any one of them by looking at the wrong one under compression. It is more certain to open all relief or compression cocks except the one you are testing, closing them as you progress with the work. If a bubble appears between the shell of the plug and porcelain or mica, it is evidence that the plug needs tightening or a new gasket fitted. If the bubble appears at the seat of the plug it is evidence that the plug is not properly seated and needs to be taken out and a good coat of flake graphite mixed with cylinder

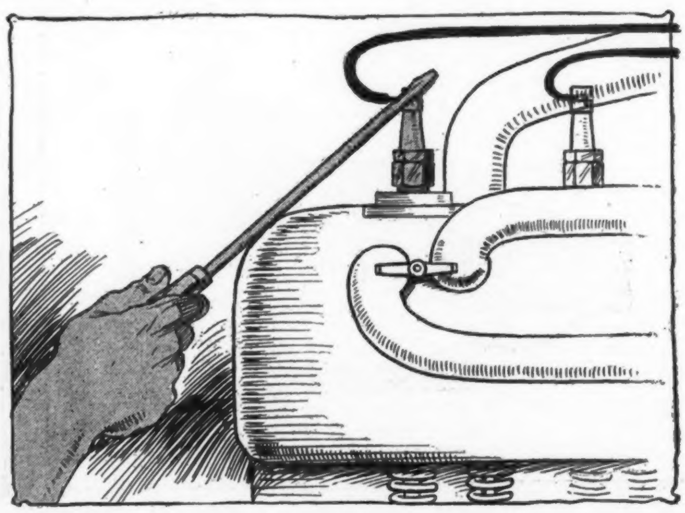


Fig. 4—Short circuiting plug to detect which cylinder is missing

oil, to the consistency of putty, placed all over the threads of the plug. Then screw it carefully into its seat, not too tightly, as this would cause it to crack its porcelain and cause it to stick at times. If you have no new gaskets on hand you can make as many as you please by taking a piece of asbestos and a pair of shears and cut out a round ring to fit over the porcelain and then screw the packing nut tightly home. If you test for these slight leaks you will be surprised at finding them when you least expect to do so.

Bad Connection in Coil Box

Editor The Automobile:—We have a Rambler model 53, sold in 1910. It has a Splitdorf vibrating coil and we cannot crank the motor on this coil or battery side, but if we will press on the starter button on the side of the coil box we get a good spark at the cylinder. If we crank this motor on the magneto it will run as well as ever, but when the switch is on the battery side it will stop at once unless the button is pressed on the side of the battery box. As long as this is done the motor will run as well as ever, but the moment we stop pressing on this button it will stop. When switched on the magneto is runs well. The batteries are good (testing 28). The vibrator points are clean and we get a good spark at the plugs when we press the button, but rarely get one when not pressing the button.

Can you help us out of this trouble?

Iuka, Kan. Maynard & Phillips.

—The trouble is in a broken connection in the coil box, the spring not being in contact with the rest of the circuit. When the starting button is pressed the contact is made and hence the motor will run. The box cover should be removed and the spring bent up slightly, or the coil should be sent to the Kansas City Splitdorf agency, where the disconnected parts will be put in good order.

Wiring Used on Six Cylinder Cars

Editor The Automobile:—What is the best wiring scheme to use on the 48-horsepower six-cylinder Pierce Arrow car?

2. How can you detect which cylinder is missing on a six-cylinder car?

New York City. Jerome Wilson.

—The wiring diagram which depicts the wiring scheme more clearly than it could be described is shown in Fig. 5.

2. If you will take a screw-driver, place it first against the metal of the cylinder and then against the tops of the spark-plug in the manner shown in Fig. 4 you will be able to detect which cylinder is missing fire. The method of procedure is to do this with each cylinder in turn, noting the effect. Whenever you reach the cylinder that does not indicate any effect or difference in the running when the plug is short-circuited in this manner you will find the one which is misfiring.

Engineer on Ether for Starting

Editor The Automobile:—Having seen a number of requests lately in your journal regarding the action of ether as a primer for starting in cold weather, it may be of value to your readers to know that I have used for this purpose for the past 7 years a mixture of one-half gasoline and one-half "commercial" or "washed" ether.

The mixture is placed in an ordinary half-pint can with a cork over the tip when not in use.

I squirt about one-quarter ounce of the mixture into each priming cup and have never known any motor to fail to start with one-quarter turn of the crank, that is, one pull up.

I have had the motor occasionally start on the spark even in very cold weather.

I have absolutely no bad effects from its use in any way.

Contrary to a popular impression ether does not cause abnormally high pressures in the cylinders.

The washed ether costs 35 cents per pint at wholesale druggists and comes in sealed tin cans. Two pints will usually last me through the winter, so that the expense thereof is but a trifle.

Detroit, Mich. Edward T. Birdsall, M. E.,
Consulting Engineer.

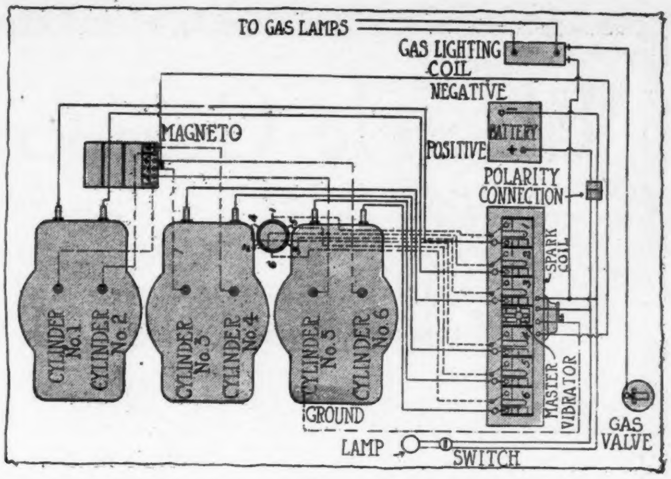


Fig. 5—Wiring diagram for ignition and gas lighting as used in the six-cylinder Pierce-Arrow 48, 1912 model

Blames Low Test Fuel

Editor The Automobile:—I have two cars which seem to lose much power in cold weather, yet they seem faultless in carbureter, ignition and compression. I blame much of this trouble on low test gasoline which I find tests as low as 59. Would you consider a higher test gas, say 73-76, would be better for use in winter when cars are usually cold? If so, kindly explain in what way, also if it is quicker and better at any time. I also have trouble in plugs becoming sooty.

2—I note the Standard Oil Company marks its shipments of 73-76 gasoline "Naptha." Has that any particular significance?

I am not prone to pay a high price to get a high test gas but would prefer to do so if it is much superior. Please advise through Letters Answered and Discussed.

Whitehouse Sta., N. J. J. H. Dilts.

—In cold weather a car will never pull well until the motor becomes warm. If the radiator area used in winter is the same as that used in summer it stands to reason that the motor will run cooler and hence with much less efficiency. Therefore, it is necessary to cover the radiator in cold weather to prevent the radiation of the heat from the motor. If this is done you will find that a short time after starting the motor will pull as well in winter as it does in summer. As a matter of fact, there is more power in the lower test fuel than there is in the higher and after once getting the motor started, the lower grade will give good satisfaction. If you are burning too rich a mixture or using oil which is just as heavy as that used in summer, the trouble with the plugs is explained. Try a lighter grade of lubricating oil.

2—The name given by the oil concerns to the gasoline used in automobiles is auto-naptha. This is merely a name and has no special significance any more than it marks a certain limit in the distillation. That is, it indicates that in the refining process the cut, or lower limit of the refined product has been set at a definite point.

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The Editor of this department is holding numerous letters signed Reader, Subscriber and by various initials which cannot be answered until the name of the sender be known. Owing to the large number of inquiries received many letters are answered by mail instead of through these columns; those of general interest being selected for the latter purpose. Anyone may receive a direct reply by mail by stating their desire and enclosing postage.

Electric Cranking and Lighting

Part I

Giving An Elementary Review of the Requirements of a Complete Electric System and a General Introduction to the Subject Before Taking Up a Consideration of Each System

Subject Digest

¶ For electric cranking it is necessary that a supply of current be on hand to operate the cranking motor for a sufficient length of time to start the engine under the most adverse conditions. Since there are no moving parts before starting the engine the source of the current must be a battery.

¶ The length of time that a battery can supply current for any purpose is limited; therefore, it is necessary that some means be provided to replenish the current drawn from the battery after it has started the engine by means of the cranking motor. The means must be generator mounted on the car because an outside source is impracticable.

¶ Three types of electric system are used. The single-unit system combines in one instrument the generator for lighting and ignition and the cranking motor. The double-unit system combines any two of these and has the other unit separate. The three-unit system has the generator, the cranking motor and the magneto separate.

¶ Each unit must be protected and regulated so that it will be impossible for it to be damaged or to cause damage.

WITH the adoption of electric cranking on 69 per cent. of the cars which are using starters at all, the problem of proper electric installation both from a standpoint of standardization and good practice, becomes highly important. On such a car the primary requirement is that electric current must be available for three purposes—namely: ignition, lighting and cranking.

The requirements of the ignition system, when independent, are few and have been solved in the past. The sole duty of the ignition system is to supply a current at the electrodes of the spark-plug of such strength that it will cause a spark to jump across the gap. The source of the current may be either a battery, a magneto, or a device performing the functions of the latter.

For lighting it is necessary that a continuous flow of current be delivered at the lamps. The current for the lamps must maintain a steady pressure or voltage in order that the glow of the lamps will be uniform and that the filaments will not be destroyed owing to excessive pressure or, in other words, voltage. The source of supply may be from a battery or a generator.

For electric cranking a current must be drawn by the cranking motor which will be of sufficient quantity to turn the engine. **The sole purpose of the electric motor is to crank the engine, and when through with this work the current need not be supplied to it. Therefore, the current must be controllable by the driver.** The source of this current must be a battery because when the cranking is required there will be no units in motion, and hence nothing about the car which can generate the current necessary at the time.

The above three paragraphs show that the battery may supply current for either cranking, lighting or ignition.

Since the length of time that a battery can supply current is limited, and since for at least cranking and lighting the battery must be always available, it is evident that there must be a means of producing electrical energy which will replace that taken out. This energy may be either from an outside source or it may be from a generator of electric current on the car itself. Discarding the outside source as obviously impractical and unhandy, only one alternative remains, namely, to mount a generator on the car. Since it is impossible to store an alternating current in a battery the generator must supply a direct current.

It should be noted here that a magneto is a generator which supplies an alternating current, and therefore could never be used for storing a battery. For that reason alternating current generators are not used for auto lighting.

A direct current generator supplies a current which may be used for storing electric energy in a battery, for ignition purposes and for lighting purposes. It is therefore evident that a battery and a generator used in conjunction with one another are sufficient to maintain a supply of current at the disposal of the operator of the car for any purpose to which he wishes to put it.

From what has been said it may be seen that there are three units necessary for an electric cranking system. First, a battery which may be compared to the water tank on the top of a house which holds a supply that may be available for any purpose whenever it is desired to draw it off. Second, a generator which has its parallel in the water pump which raises the water into the tank. Third, the cranking motor which is like the water wheel or water motor which is operated by the water in the tank. The switches controlling the supply of current and its application may be directly compared to the various valves used for turning on and off the water and for controlling the direction of its flow.

Regulation and protection of the various units of an electric system are necessary in order that they continue to bear the

proper relationship to one another under all operating conditions.

The battery must be protected in two ways: First, against discharge of the current contained at improper times or when the battery is not in use. Second, against the injury which would result should the battery be charged too rapidly. This occurs when the outside source supplies the current at too high a rate or when the generator on the car is driven rapidly at high engine speeds, such as in fast running or hill climbing. These two danger points are the same as those which must be guarded against in the case of the water tank, to which the battery is comparable. It must be guarded against the leakage of its supply when the pump is stopped or against being filled so rapidly and by such a violent stream that the water is thrown out of the tank or even, in an extreme case, destroys the tank itself.

The electric circuit, of which the lamps are a part, must be protected against an excessive voltage, or electrical pressure, which would burn out the delicate filaments of the lamps. These would be destroyed first because they are the weakest part of the circuit.

The protection of one unit in an electric system is secured by the regulation of others. To prevent the battery from allowing its charge to pass back through the generator when the latter is stopped, a reverse current cutout is used. Its use and purpose correspond exactly to that of a ball check valve, which permits the water to flow from the pump into the tank on the house, but prevents its return back through the pump when the pump is stopped.

The protection of the battery against an excessive charging rate is accomplished by regulating the generator in four ways, as follows:

1—Mechanically, by a centrifugal governor and a clutch which is allowed to slip as the speed of the engine increases. This is shown diagrammatically in Fig. 5.

2—Electro-magnetically, by the changes in magnetic power of an iron core due to the variations in the current passing through a coil wound around that core and the electrical output is made a function of the engine speed. Generally the magnet acts against a spring and extends or compresses it in proportion to the power of the magnet. This method of regulation is shown diagrammatically in Fig. 5. This control of electrical output may be a function of the speed in one case or of the pressure or voltage in another.

3—Inherently, by making the generator in such a manner that throughout the range of working speeds a nearly constant current output is produced. This is accomplished by compound windings which operate against each other in such a manner that the resultant is always the same. It may be compared to a man rowing against a stream whose current is swifter toward the center. If he moves against the stream at a constant rate he must row more rapidly as he gets into the faster current, but the difference in his actual speed and the speed of the current will be constant.

4—Thermally, by the increase of resistance due to a rise in the temperature of a conductor, the increase coming into play when the generator output is too great. It requires more energy to send an electric current through a wire when it is hot than when cold. Advantage is taken of this principle in one method of regulation.

With the system in mind as so far outlined it would be well to turn to a complete hydraulic parallel with an idea of showing clearly the relative conditions which must obtain between each member of the system. The diagrammatic layout in Fig. 4 shows this completely. The battery is represented by a storage tank, the generator by a pump, the cranking motor by a water motor or water wheel, the lamps by small water wheels, the switches by hand-operated valves, the reverse current cutout by a check valve, the generator output regulator by a governor, which disconnects the pump when the speed becomes too great, and the wires by pipes.

With a clear outline of the electric system in mind the study of its operation and manipulation becomes simply a matter of taking up the action of each unit. With the system stationary the first move must be caused by the current which is in the battery. It is necessary to draw on the supply which has previously been stored there. There must be sufficient current in the battery to operate the cranking motor for a sufficient length of time to make starting certain under the most adverse circumstances. Given the source of electrical energy and the necessary units with which to transform the same into work or vice versa, the application of the principles is all that remains.

Electric systems on automobiles may be classified according to the grouping of the elements of which the system is made up. There are three systems, the single-unit, the two-unit and the three-unit.

The single-unit system—In this system the cranking motor and the generator are combined in one unit which is known as a motor-generator. In addition the generator portion of this unit performs the functions of a magneto.

The two-unit system—The two-unit system is subdivided into two classes:

A—Where the cranking motor and the generator are combined in one unit and the magneto forms the other. In this system the units are known as a motor-generator and a magneto.

B—Where the cranking motor and the generator are separate units and the generator performs the functions of a magneto; or, in other words, supplies the current for ignition.

The three-unit system—In this system the cranking motor, the generator and the magneto are all separate and distinct units.

The different classifications may be brought out diagrammatically.

In applying the different units to the engine certain laws of

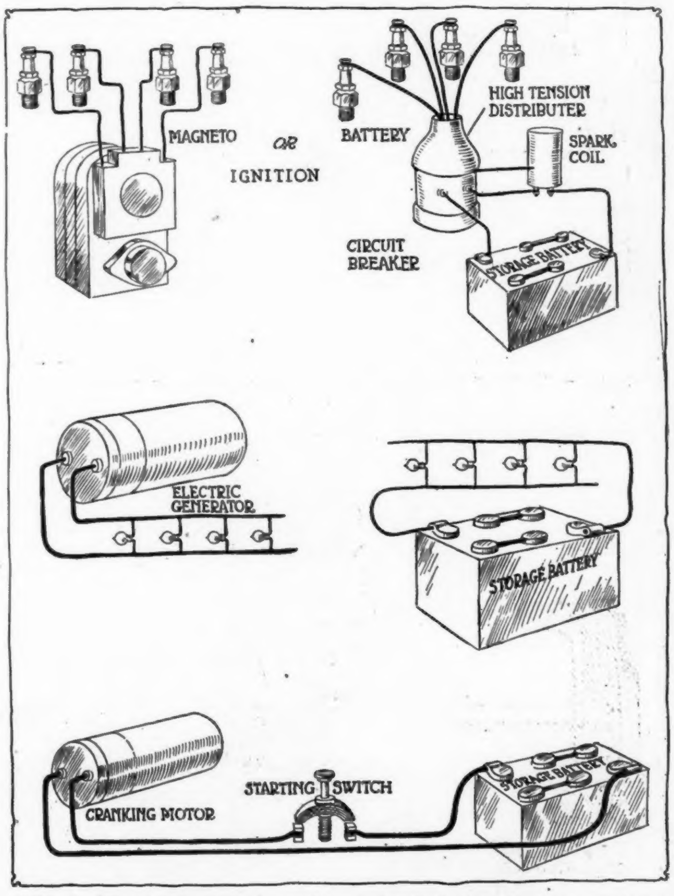


Fig. 1—The fundamental requirements of electric ignition, lighting and cranking. Top—Magneto or battery furnishing current for ignition. Center—Generator or battery furnishing current for lighting. Bottom—Battery furnishing current for electric cranking

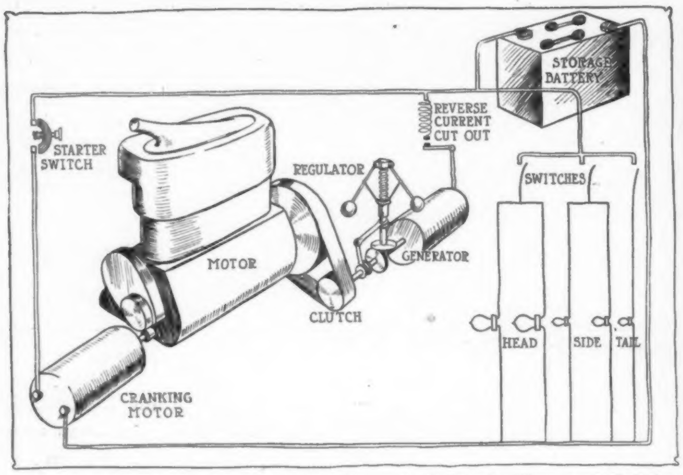


Fig. 2—The elementary layout of an electric starting and lighting system

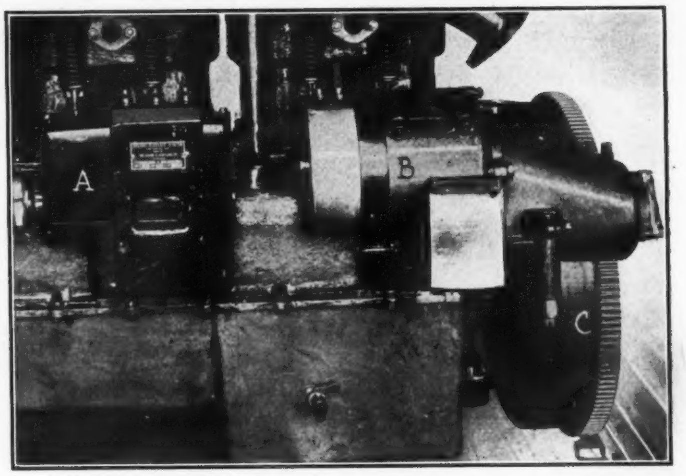


Fig. 3—The installation of the Locomobile cranking motor B on flywheel C

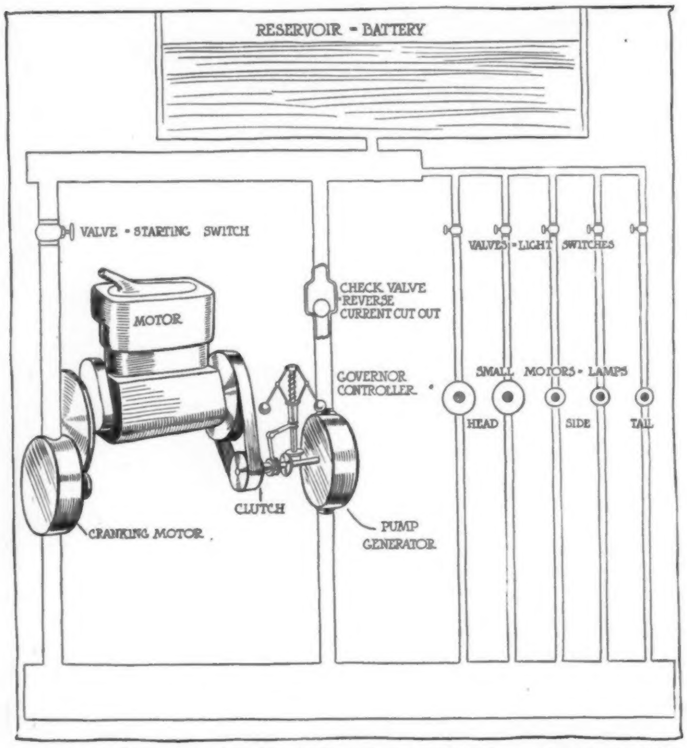


Fig. 4—Diagram showing hydraulic parallel of an electric ignition starting and lighting system.

relationship must self-evidently hold; these may be stated as follows:

The generator of the ignition current must bear a constant relationship to the engine crankshaft for proper ignition timing. Every time the crankshaft of the engine is in a given position the ignition-current generator shaft must be in a fixed, definite position in order that the spark will occur at the proper time.

The generator for the lighting current need not bear a constant relationship to the engine crankshaft, although the gear ratio between the two will be constant for any given installation. The difference is caused by control features which will be explained later. These permit the driving mechanism to revolve more rapidly than the driven. The gear ratio between the generator and the crankshaft varies between 1 to 1 and 4 to 1.

The cranking motor may be installed in any number of ways. It may rotate at crankshaft speed or at 100 times crankshaft speed, i. e., from no reduction to 100 to 1 reduction. When not needed for cranking the motor and when mounted as an independent unit, the cranking motor is at rest. A motor-generator may run at two speeds: first, when operating as a generator, and, second, when operating as a cranking motor; it must also have an automatic means for making the change. The devices used for this purpose are roller clutches, eccentric gears, epicyclic gears, etc. The object of these devices is simply to use the most advantageous speed for the motor when used as such and then to change to a speed which would be suitable for the generator.

To sum up the situation, it may be stated with the above gear ratios in mind that in the single-unit system the single instru-

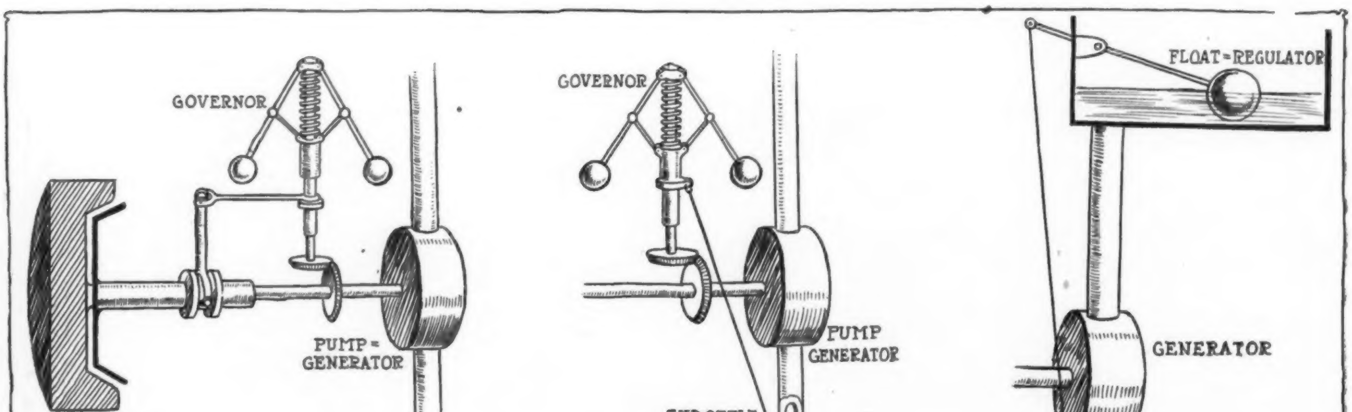


Fig. 5—Mechanical diagrams, showing graphically the purpose and the effect of mechanical, electro-magnetic and inherent regulation of generator output

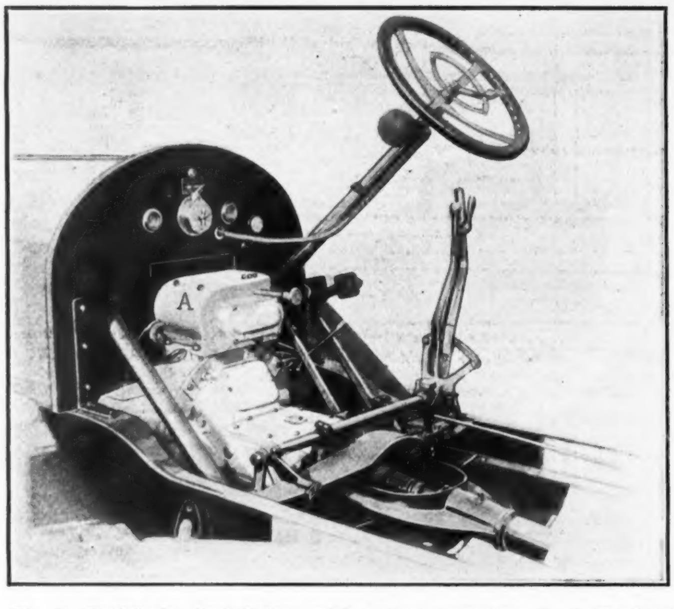


Fig. 6—Pathfinder installation with motor-generator, A, on flywheel

ment is in positive engagement with the engine and rotates whenever the latter is in motion.

In the motor-generator two-unit system the motor-generator is in positive engagement with the engine and rotates whenever the latter is in motion. The magneto does likewise. When the magneto is incorporated with the governor and the cranking motor is separate the generator rotates with the engine while the cranking motor is only in engagement with the engine when it is desired to start.

In the three-unit system the cranking motor is only in engagement with the engine when it is desired to start. The generator and the magneto both rotate with the engine.

In all three systems it may be noted in summing up the situation that, unless the cranking motor be incorporated with the generator into a single unit, the cranking motor will be in engagement with the motor only when cranking and when the engine is running under its own power the cranking motor will be at rest.

The methods of connecting the cranking motor to the engine are at the present moment a matter of concentrated study on the part of both the car manufacturer and the designer of the electric system. The life of the cranking system depends to such a degree on its installation that this matter is of supreme importance. The problem of motor-generator reduction gearing has been met by the following methods: planetary gearing, eccentric gearing, direct connection and silent chain. The first two allow of different speeds when used as a motor or generator. When the cranking motor is separate from the generator it may be direct connected, through spur gears, by worm gear, by slid-

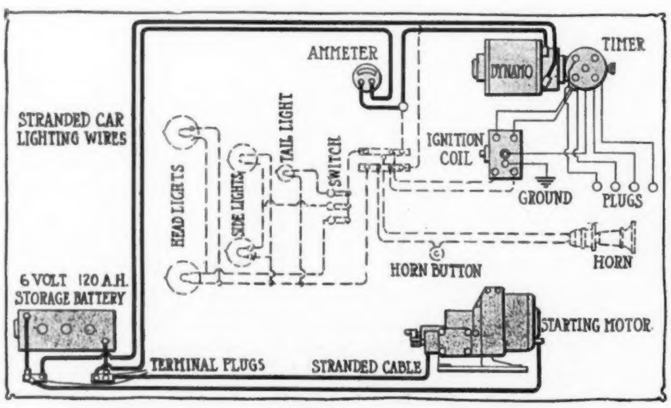


Fig. 10—Elyria-Dean wiring scheme, showing disposition

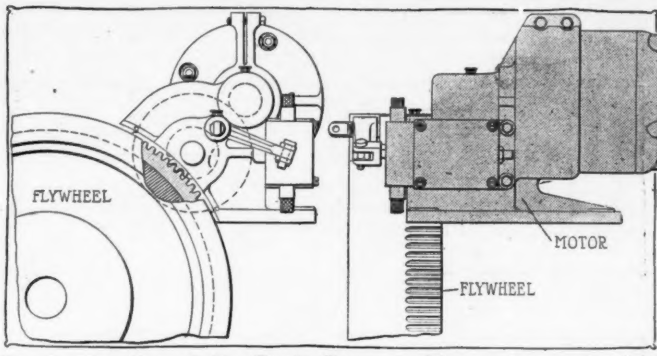


Fig. 7—Mounting of the Elyria-Dean cranking motor on flywheel of engine

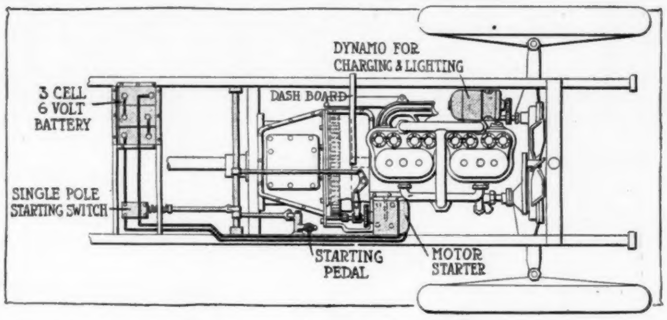


Fig. 8—Gray and Davis installation, showing wiring and location of parts

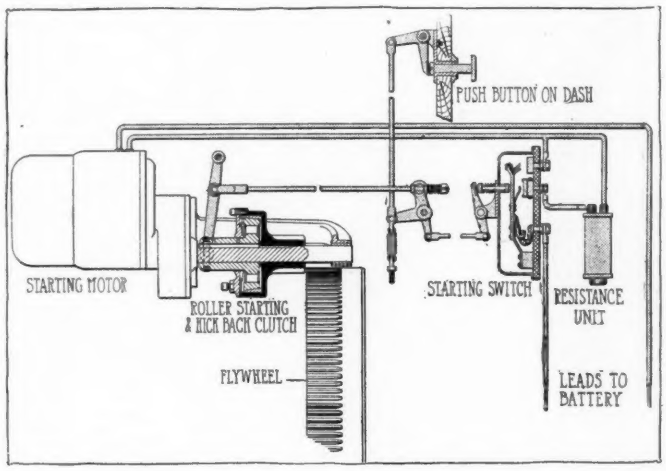


Fig. 9—Esterline control system governed from dash by push button. This button and a meter are the only fittings necessary on the dash

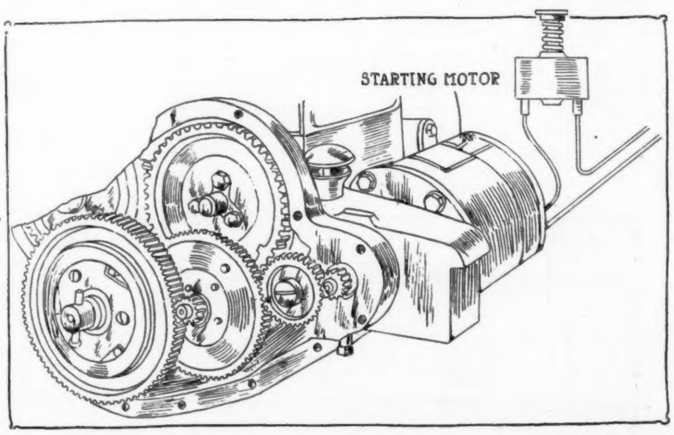
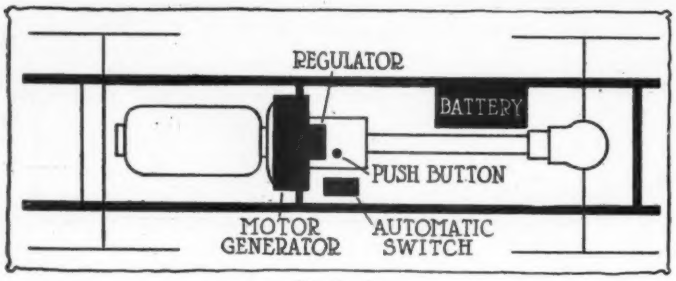


Fig. 11—The Abbott cranking installation is through spur gears



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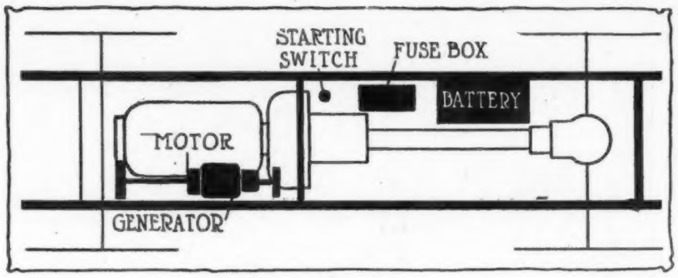
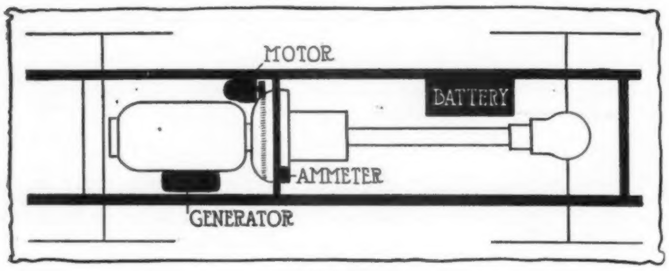
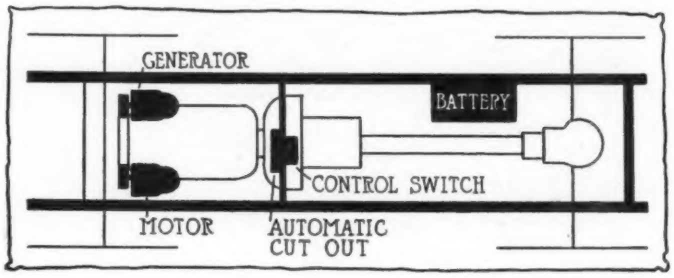


Rushmore



Elyria-Dean



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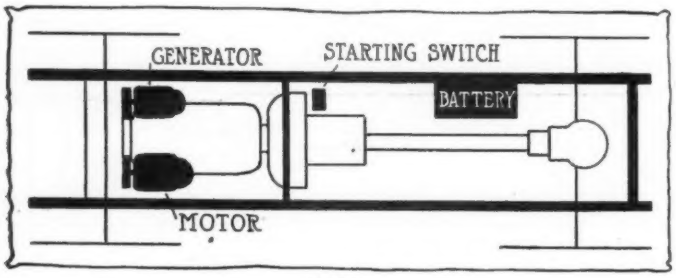
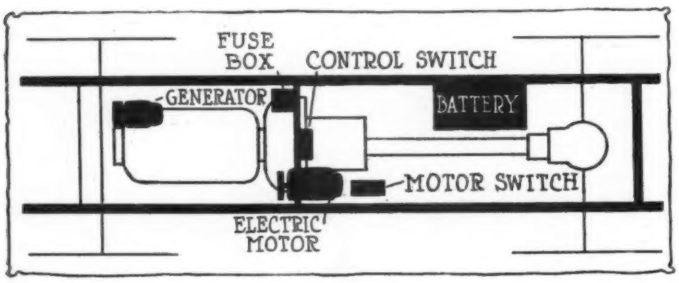
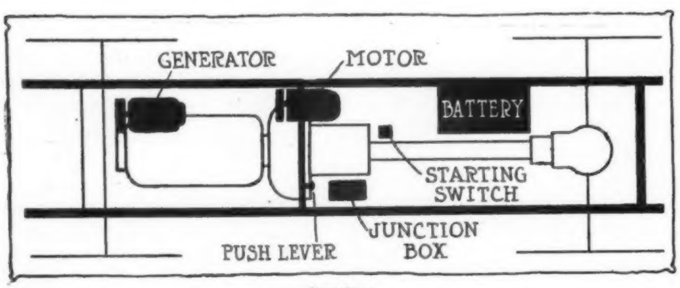


Abbott



Electro



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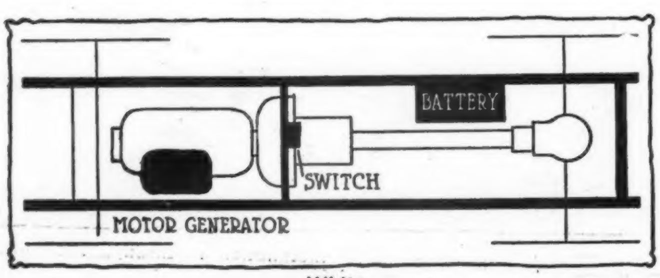


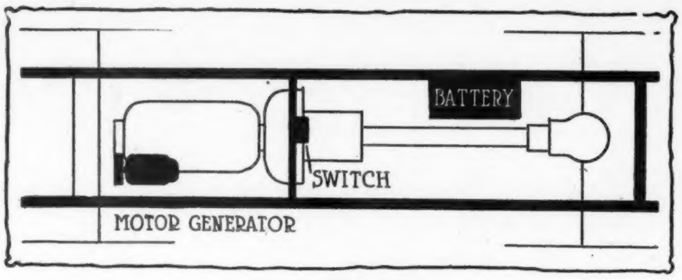
White

ing gear or by silent chain. Direct connected motor generators are commonly mounted in or replace the flywheel and perform its functions.

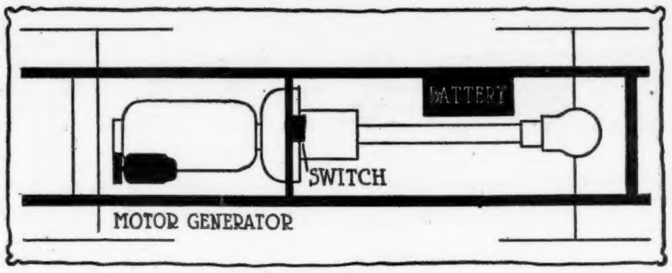
Since, when the cranking motor is separate from the generator, it is disengaged from the engine, the driving mechanism must be supplemented by some device which will disengage it. This is generally in the form of an overrunning clutch. Besides this it may also have a kickback release which is so designed that when a back kick occurs the cranking motor is automatically disengaged. Some type of anti-clashing device which prevents injury to the gears in engaging and releasing is also a part of the installation on some cars. In some instances the device which prevents the clashing of the gears is incorporated in the control mechanism.

After considering the connection of the cranking motor to the engine, the connection of the storage battery to the cranking motor should be considered. The connecting link between the battery and the cranking motor is the starting switch. These switches are of three types: the knife switch, the laminated switch or the two-point switch. The first two mentioned are common switch types and need no explanation, the two-point switch, however, should be explained. The first point in the switch and the second point are connected by a resistant material. When the switch is closed at the first point the complete circuit is closed, but the current must pass through the resistance between the first and second points. When the second point is closed the resistance no longer comes into play and the obstruction to the current is removed. The object of the two-point switch is to allow the cranking motor to revolve slowly at first in order to secure a perfect mesh of the gears without the clash which might occur were it attempted to mesh the gears when the cranking motor was revolving rapidly.

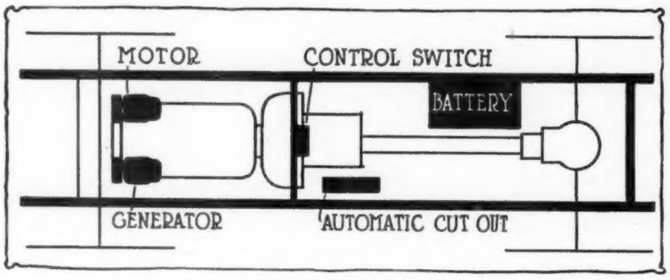
As far as the operator is concerned the devices which he must use to control the starter should be simple and also sightly. They must be simple in order that a driver who is not a mechanical genius may be able to operate the system without damaging it and they must be sightly because the mounting is generally in a conspicuous or at least exposed position. Two types of controller as usual, although there are several variations in isolated cases. The two usual types are the foot or hand push switch and the lever switch. The foot switch is placed on the floor of the car in such a position that it may be readily reached by the foot of the driver. On some cars it takes the place of the muffler cut-out. The lever switch is used very commonly with two-unit systems. The running position of the lever is generally down or in, and when in this position the motor-generator is in continuous operation. When the car is traveling less than a



Electro



Northeast



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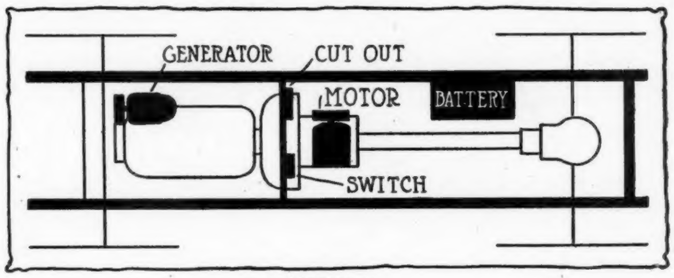
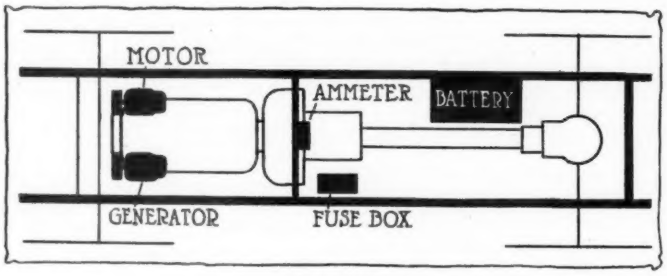
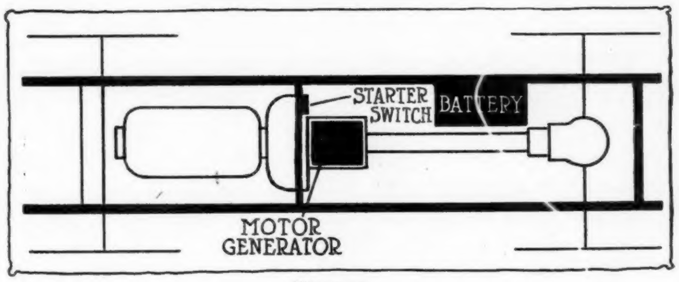


Hartford



Auto-Lite



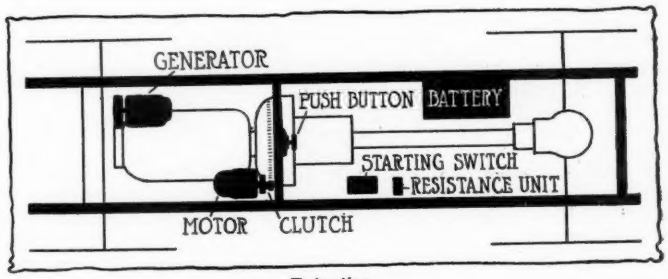
Warner

certain speed the motor-generator is acting as a motor and is aiding in the propulsion of the car. When the speed mounts above a certain point the motor-generator acts in the capacity of a generator and charges the storage battery. When the lever is up or out, electric connection between the battery and the generator is broken.

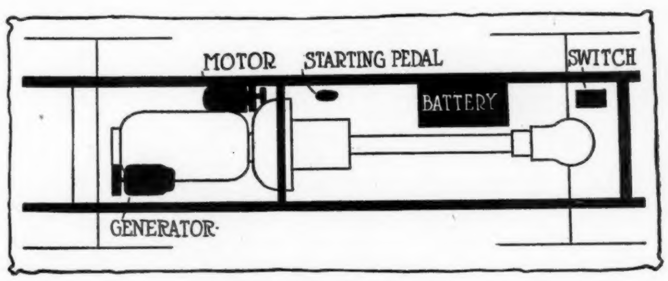
The question of wiring is an important one. Given a system which operates at 6 volts, the wiring should be of low enough resistance to deliver the 6 volts at the terminals. With a larger wire than necessary the resistance to the current is so great that in some cases it will render the system inoperative. The voltages used in electric cranking and lighting systems range between 6 and 24. Where the lighting voltage is different from the cranking voltage, different wire is often used for the two systems. The three-wire system is common with many of the lighting systems. Where a 24-volt battery is used and the lights are operated at 12 volts a wire is run from the center of the battery so that the difference in potential between the end wires and the center or neutral wire is 12 volts. The wires are then strung across between the end wires and the center wire.

—

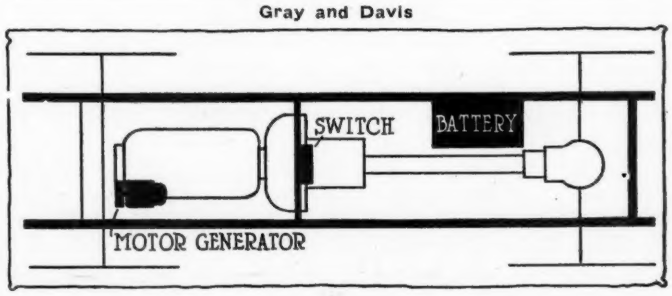
Charging of batteries should be begun at the highest rate given in the instruction of the makers and should be continued at that rate until gassing sets in, when the rate of charging should be reduced to such a degree that the development of gas ceases and continued at that rate. When gassing begins again the rate must be reduced once more and then the battery is charged the full capacity, at the so-called finishing rate, which is also given in the instructions accompanying the battery when received from the manufacturer. Another important point is that the battery should not be left standing idle or rather in discharged state, as the formation of a lasting or at least stubborn deposit of lead sulphate is apt to be the result of such a treatment.



Esterline



Gray and Davis



Entz

Late Developments in the Contest Field

Teddy Tetzlaff Disqualified as Racing Driver Till May 28
Chicago Club's Novel Reliability To Be Run June 25-28
Eighteen Racing Cars Entered in the French Grand Prix

AT a meeting of the Contest Board held at A. A. A. headquarters, Friday, Jan. 10, at which were present David Beecroft, P. D. Folwell, H. W. Knights, Frank G. Webb, Wm. Schimpf, chairman, the following action was taken:

The automatic disqualification of Teddy Tetzlaff, of Los Angeles, registered racing driver No. 166, for driving exhibitions at an unsanctioned race meeting held at San Fernando, California, on November 28, 1912, was definitely fixed to expire on May 28, 1913. E. E. Hewlett, of Los Angeles, manager of Tetzlaff and owner of the Fiat car driven by him at such unsanctioned meeting, was rendered ineligible for participation in any event sanctioned by the A. A. A. for a like period.

The application for reinstatement to good standing of the Staver Carriage Company, of Chicago, manufacturers of Staver-Chicago cars, who were on October 21, 1912, disqualified and suspended to June 1, 1913, for violation of rule 75 of the contest rules in advertising the performance of the Staver-Chicago cars which participated in the Around-Lake-Michigan tour conducted as a Grade III Non-Stock run, as being the performance of Stock Cars was considered and denied.

Frank C. Hamlin, of Los Angeles, entrant and driver of the Franklin car which won the 1912 Los Angeles-to-Phoenix desert road race, was disqualified and suspended until April 1, 1913, for violation of rule 75 in advertising and winning Franklin as a regular stock car, when the race in question was conducted as a non-stock, free-for-all event.

To Arrange Jacksonville-Atlanta Run

ATLANTA, GA., Jan. 10—The Atlanta Automobile and Accessory Association, at its meeting Thursday, appointed a committee to co-operate with a similar committee of the Jacksonville Automobile Club in promoting a run from Jacksonville to Atlanta in April. Some time during that month there will be a week of Metropolitan Grand Opera Company productions in the Gate City and the run will be held at a time when the tourists can attend these affairs.

Chicago Club Plans Novel Reliability

CHICAGO, ILL., Jan. 13—The Chicago Automobile Club, encouraged because of the success of the 1912 Elgin road races, which it promoted in conjunction with the Elgin Automobile Road Race Association, has determined to venture into the promotion of other motor contests. Announcement was made today that the C. A. C. would stage one of the most novel reliability runs ever attempted—a non-motor stop, night-and-day trip from Chicago to Boston by way of New York City. This will be run the last week in June and it is figured that the trip can be made in 3 1-2 days.

As roughly outlined now, it will be a non-stock event run under grade 3 of the A. A. A. rules, but maybe a stock car division will be added if enough entries are forthcoming. There will be a change of drivers and observers both morning and night, and it will be necessary to secure a special train to follow the tour to carry the relief crews and the officials. The rules will require that the motors be kept running continuously, even when taking on fuel and water, in order to escape penalization. It has been suggested that the entry fee be placed at $200, which would give the entrant the choice of starting one, two or three cars.

Co-operation with other clubs along the route will be sought. The Bay State Automobile Association already has proffered its services and it is thought Buffalo, Cleveland, New York and other big cities will do likewise.

CHICAGO, ILL., Jan. 13—*Special Telegram*—Dates selected for the reliability are June 25 to 28. The tentative schedule calls for controls at Toledo, Erie, Rochester, Albany, New York City and Boston. The distance is 1,276 miles and it is estimated that it will require 67,967 hours to make the journey.

Eighteen Cars Entered in Grand Prix

PARIS, Jan. 3—On the last day of the old year the entry list at ordinary fees closed for the French Grand Prix race to be run near Amiens early next July. The list contained eighteen cars, and unless manufacturers decide to pay double fees at the rate of $1,600 per car, this number of competitors will start in the classic. The low number comes as a surprise, but is due to the high entry fee charged, the ordinary rate of $800 per car having kept several out, and also to the peculiar difficulties of building cars to compete under limited fuel rules.

The entrants are, for France, three Peugeots, three Th. Schneiders and two DeLage; for England, four Sunbeams; for Germany, one Mathis and one Opel; for Italy, three rotary-valve Italas; for Belgium, one Excelsior.

A curious incident has arisen in connection with the Mercedes entry. Last September the Belgian agent for the Mercedes car sent a check to cover the entry of three cars. This was refused, for the rules state that all entries must be made by manufacturers. Just before the final closing a second check was sent by the Mercedes agent in Belgium, and also by the English agent, acting through the Royal Automobile Club. They were both refused, according to the rules, but it was believed that the agents would induce the factory to make the entry for them. This they have evidently been unable to do, for no direct entry has been sent. The Belgian agent has ordered a set of special cars from the Mercedes factory, but has evidently overlooked the fact that he would not be allowed to enter them himself.

Indiana Tour to Start July 1

INDIANAPOLIS, IND., Jan. 6—Eight o'clock on the evening of July 1 Indiana's great automobile tour to the Pacific Coast will leave this city. So definitely are the preparations being made that even the time of the departure can be announced.

At its recent meeting the Indiana Automobile Manufacturers' Association adopted the plans proposed for the big journey from the Hoosier capital to either San Francisco or Los Angeles. It will be a pathfinding expedition for the great rock road which some day will extend from the Atlantic to the Pacific Oceans, and for hundreds of tourists who yearly travel across the continent. Not only did they heartily approve of the general route and the details, but they also supported this by the definite promise of the entry of twenty-six cars.

Minor Shows Throughout the Country

All Milwaukee Dealers Join in Show for the First Time—Automobiles To Be Shown at Panama-Pacific Exposition Attendance at Montreal Over 35,000—Business $300,000

MILWAUKEE, WIS., Jan. 13—The striking feature of the fifth annual Milwaukee motor show, which opened in the Auditorium on Saturday evening, January 11, and closes Friday evening, January 17, is that for the first time since motor expositions were started in Milwaukee, every local dealer is represented by an exhibit.

Not being included in the national show circuit fostered by the manufacturers' organizations, Milwaukee was obliged to do a lot of tall hustling to make its show a success as compared with the expositions of nearby cities, notably Minneapolis, Kansas City, Denver, Indianapolis, Detroit and Cleveland, but it has done so.

There are represented in the show seventy-one distinct makes of pleasure cars, with an aggregate of 169 models on display; seven makes of electric cars, with twenty-three models on display; fourteen distinct makes of commercial vehicles, with forty-seven models on display, and twenty-seven distributors of supplies, accessories and parts, representing more than 500 factories.

From these figures it will be seen that Milwaukee could have done no better, and probably not as well, had it been included in the national show circuit.

Milwaukee dealers have fared well with their factories in being able to present cut-out chasses, polished chasses, and other novelties in stripped or finished cars which make a show more interesting than otherwise. In this connection it may be said that the cut-out chassis of the Hickman-Lauson-Diener Co., state agent for the Ford, is one of the most elaborate and instructive exhibits in the show.

It is also worthy of note that in addition to exhibits from every dealer in Milwaukee, outside factory representatives, factories or large distributors whose cars are not represented in Milwaukee by direct agents are showing products. Among these are the Peerless, Cole, Pathfinder and Enger. Cars which gained representation in Milwaukee since the last show in January, 1912, and now in the Milwaukee show for the first time include: Cartercar, Staver, Little, Chevrolet, Marathon, McFarlan 6, Stanley, Pullman, Nyberg, Davis Flyer, Metz, Premier, Stevens-Duryea and Velie.

There are meetings during the week of the Wisconsin Retail Automobile Dealers' Association, the Wisconsin Association of State Agents, the Wisconsin State Automobile Association, the organization of owners; the Wisconsin Commercial Car Association, the Wisconsin Accessories Association, and a half dozen lesser organizations which have to do with the sale and use of motor cars, parts, etc.

Automobiles for 1915 Panama Show

America may have in 1915 at the Panama-Pacific exposition to be held in San Francisco one of the greatest automobile exhibitions in its history. Negotiations are now under way looking to the erection of a separate building to house a motor exhibit to continue from the opening until the closing of the exposition. Capt. Baker of the exposition took up the matter of such a building with not a few of the automobile manufacturers nearly 1 year ago and since then the work of bringing the exposition authorities and the car makers together has continued.

Only this week the National Association of Automobile Manufacturers received word from San Francisco stating that the exposition company will erect a special building affording 210,000 square feet of exhibit space, and devoted exclusively to automobiles, motorcycles and accessories. The building will be a one-story structure 600 feet long and 350 feet wide.

So far the proposal has not been definitely accepted by the motorists, but it is being referred to the individual concerns and it is expected that no difficulties will be encountered. The discussed plan, in case of the acceptance of the proposal, is to handle the exhibit space similarly to the national shows. Foreign manufacturers will receive the same opportunities to exhibit as American builders.

The completion and occupancy of this automobile palace will mark the beginning of a new era so far as motor exhibits at great expositions are concerned, in that it will be the first time at which a separate building will be devoted to the automobile, the motorcycle and accessories.

Montreal Show a Great Success

MONTREAL, QUE., Jan. 11—With a wild tooting of horns and shrieks of sirens the seventh annual automobile show at the Drill Shed and Sixty-fifth Armory closed on Saturday night.

In point of the numbers of exhibits, the attendance and the business done, the show just closed showed a great advance on those of previous years. It is estimated that between 35,000 and 40,000 people attended the two shows, and the actual sales reported by dealers amount to $300,000. Not that these figures comprise all the sales made, for some of the firms approached reported that it was against their business policy to either report the sales made or label the cars sold. Privately they admitted that business and the prospects for the future could not have been better, and from $500,000 to $750,000 roughly estimates the business done. With the sales to dealers at outside points from samples shown in the show the estimate is over $1,000,000 mark.

Columbus Show Is Drawing Near

COLUMBUS, O., Jan. 11—The organization of the Columbus Auto Trades Association was completed recently when a constitution and by-laws were adopted. More than fifty dealers attended and much enthusiasm was shown in the affairs of the association. The constitution is modeled after those governing the chapters founded in many of the Eastern cities. Plans for the automobile show were discussed. The new association will co-operate with the automobile club in giving the show.

WASHINGTON, D. C., Jan. 11—A new motor organization, to be known as the Washington Motorists' Association, is being formed to take the place of the Automobile Club of Washington, which was disbanded several weeks ago. A committee from the old club, with W. C. Duvall as chairman, has drawn up a tentative constitution and by-laws.

The AUTOMOBILE

Vol. XXVIII Thursday, January 16, 1913 No. 3

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Entered at New York, N. Y., as second-class matter.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Problems To Solve

THE progress of the first few days of the dual automobile show, running this week at Grand Central Palace and Madison Square Garden, one of the greatest in the history of the industry so far as numbers of exhibits is concerned, is marked by an undercurrent of unrest with a majority of the makers, due in not a few cases to the cranking motor avalanche, to the wire wheel wave and also to the electric lighting movement.

Of these three the motor starting movement, or, as it has been designated by many, the cranking motor movement, occupies premier place. The uncertainty connected with it is not in every case confined to the automobile maker but often to the maker of the cranking apparatus. This is but natural as the movement has precipitated itself with such hurricane speed that there are some makers of cranking motors who marketed a product and scarcely had it installed on test cars for more than a week when it was found inadequate and new designs were immediately pushed through. **There is scarcely a manufacturer of electric cranking motors who is not already busy on improvements.** In fact the automobile maker is demanding something definite for his 1914 models to which he is at present looking forward. The next 4 months will witness unparalleled activity in the cranking motor field. A few are now well settled on their types.

A visitor at the show can glean in a cursory round of the exhibit spaces the unpreparedness of many car makers for the electric cranking motor. The different apparatuses are installed wherever there was available space and not where they enter into the general layout of the car to the best advantage. **As a result some of the chassis are cluttered up worse than they have been since the days of the introduction of the magneto.** As it is with many today, the installment of the cranking motor began and ended in the assembly room, whereas it should begin in the pattern shop. There are a few makers who realized well in advance that they were going to fit a certain make of cranking motor and generator to furnish electric current for lighting and cranking, and they made provision in the crankcase for such parts, but their numbers are small when compared with those who solved the problem, if the word may be used, in the assembly department.

Before another year this will all be changed, and it is a realization of this that is spurring the car builder to push the makers of cranking motors to their utmost activity. There are some exhibitors who refused to list cranking motors as equipment before the opening of the shows and have since been forced by the pressure of agents to add them. This in itself shows the country-wide influence of the movement and the strength of it. **It would seem that the buying public is asking more about cranking motors than about merit in motor and chassis design, or materials used or workmanship bestowed on these materials.** It will be impossible for the makers of cranking motors to supply the demand of the next few months and an equally difficult task with many of them to get their 1914 types ready in time.

The wire wheel movement has taken hold in real earnest. This wheel is here to stay. Its advent is creating not a few far-reaching problems. Some want to continue with the demountable rim, but the advocates of the wire wheel argue that the use of the demountable rim will rob the wheel of one of its leading merits, namely, the light peripheral weight with the consequent increase of flexibility in the car. It is expected that the final solution of this problem will largely rest with the action of the Society of Automobile Engineers, which has recently created a new division of the standard committee to handle this subject. There are few, if any, exceptions taken to the wire wheel because of the difference in appearance, when compared with the wood type. The general publicity of the wire type has reached nearly every city in the country and has paved the way for a general acceptance of it when the time comes that supply will equal demand and prices will be finally adjusted. The merit of the wire wheel in conducting heat out of the tire, and so increasing its life, is commented upon very generally.

Electric lighting has made nearly a clean sweep of the field and today it is only a question of adaptation of the desired generator to the motor and installing the lamp equipment. In this respect there are a few novelties along the line of coupling the headlights and dashlights in one, and another innovation in using a single headlight and incorporating it in the radiator. Incorporating dashlights in the baseboard of the windshield is becoming more general, and it is in this

respect that the superiority of the electric bulb as a lighting source appears to advantage, as the entire outfit can be nested in the thickness of a standard windshield baseboard. Makers of pressed metal bodies with the cowl dash are incorporating miniature hooded portions for the lights.

There has not been the anticipated progress in body lines, although in such matters as improved upholstery and a little added room there has been a very pronounced advance. With a great majority of the makers, the general lines of last year are continued. The blending of hood and body has not been carried to the anticipated extent, although many use cowled dashes, yet few of them have altered the hood lines or the body lines to conform with these.

On closed cars the pronounced downward curve of the roof over the driver's seat imparts an air of smartness that is generally commented upon, and another year will witness many modifications of it. A few makers are building limousine bodies lower than last year and some are so low that the passengers' hats will be endangered if rough roads are encountered. One or two makers are showing concealed door hinges and more are talking about fitting them for another year. The die-made sheet metal body is being used by not a few. It is a clean-cut job with the various stampings welded into one piece, not a seam showing. Such bodies are expensive except when made in large quantities as the necessary dies for a certain design will cost between $10,000 and $20,000. Many more of these bodies will be used this season and there are evidences of a general movement in favor of them.

Automobile Chamber of Commerce Formed

AT the annual meeting of the Automobile Board of Trade held January 14, the fifty-one members present unanimously voted in favor of amalgamation with the National Association of Automobile Manufacturers under the new name of the Automobile Chamber of Commerce. As the executive committee and a majority of the members of the N. A. A. M. have also voted favorably it is but a matter of form until the amalgamation takes place and the time-honored name, National Association of Automobile Manufacturers, becomes a matter of history, and with it will go the more recent organization, the Automobile Board of Trade, which came into being after the decision against the Selden patent 2 years ago, which brought about the end of the licensed association and out of which came the Automobile Board of Trade, as it is known to the industry at the present time.

The new Automobile Chamber of Commerce will be joyously hailed by all, as it means the end of the dual organizations which have been practically covering the same field. For example, the N. A. A. M. has at present 105 members and the Board of Trade has sixty-five, and of these sixty-five all excepting one are also members of the N. A. A. M. Amalgamating the two will mean the end of two separate committees on legislation, two separate committees on roads, etc., etc. Amalgamation means a 50 per cent. simplicity in the management of the industry.

There yet remains much to be done before the final act will be accomplished and the dissolution of the two present organizations accomplished. Each organization will get the unanimous approval of its entire membership roster. A charter will then be applied for the Automobile Chamber of Commerce and a general meeting of the membership of both organizations called, at which meeting the organization of the new body will take place. It is expected that the articles of incorporation will be practically identical with those of the present Board of Trade. When the Chamber of Commerce is formed all of the present membership of the two organizations will be permitted to join and the open-door policy will be extended to outside manufacturers.

The Automobile Chamber of Commerce will undoubtedly take over the present assets of both existing organizations and the work of them will be carried on under the new management. These will include shows, legal, patents, good roads work, statistical, etc.

At the meeting the Automobile Board of Trade reelected its officers of the past year, namely: Charles Clifton, president; C. C. Hanch, vicepresident; R. D. Chapin, secretary; George Pope, treasurer; H. A. Bonnell, general manager, and the following directors: Hugh Chalmes, John N. Willys, S. D. Waldon, W. C. Leland and S. T. Davis, Jr.

C. GORDON REEL, the New York State Superintendent of Highways, has submitted to the State Legislature the annual report on highway construction, maintenance and improvements, from which the following is an extract:

The status of highway improvement to date in the State of New York is as follows:

	Miles
State highways and county highways now improved	3,578
State highways and county highways now under contract	1,627
Expedited routes not contracted for but the construction of which was contemplated in the expediting bills of 1910-11	298
Remaining state highway and county highway to be improved	6,483
Total	11,986
Of the town highways to date there have been macadamized	3,514
Improved as gravel roads	8,500
Shaped, crowned and standardized as to width	50,000
Put in safe condition for travel	6,000
Total	68,014

Total mileage of public roads in the State of New York, 80,000 miles.

All of the original $50,000,000 bond issue has been appropriated and is accounted for as follows:

Original authorized bond issue highway improvement fund	$50,000,000.00
Expended appropriations to January 1, 1912	22,188,593.56
Balance unexpended January 1, 1912	$27,811,406.44
Expended for all purposes from highway improvement fund to December 1, 1912	8,073,157.58
Remaining from previous appropriations unexpended December 1, 1912	$19,738,248.86
Appropriation, chapter 247, Laws of 1912, available October 1, 1912	1,045,000.00
Balance unexpended, salary appropriations reverting to highway improvement fund October 1, 1912	27,372.24
Comptroller's balance, highway improvement fund, December 1, 1912	$20,810,621.10
Obligation	
Balance due on contracts not expedited December 1, 1912	$8,455,810.58
Elimination of grade crossings ordered to date	199,733.49
Balance original bond issue not obligated December 1, 1912	284,518.03
Balance due on contracts for expedited routes December 1, 1912	9,447,546.91
Balance available for expedited routes not under contract December 1, 1912	2,422,972.09
	$20,810,621.10

During the calendar year there has been placed under contract 1,003 miles of State highway and 517 miles of county highway, and there has been completed a total of 662 miles.

Standards Committee of the S. A. E. Meets

Tentatively Adopts Report of the New Division on Motor Testing Which Presages Standardization of Methods for Testing Automobile Engines

THE Standards Committee of the Society of Automobile Engineers held a meeting at the headquarters of the Society, Wednesday, at which the various division reports were submitted to the committee as a whole and passed to the Society for consideration later in the week according to the program. Chairman Henry Souther called the meeting to order at 10.30 a. m.

The report of the Aluminum and Copper Alloys Division was the first to be read by the chairman, Wm. H. Barr, whose communication was short. Two alloys were recommended by the division for addition to the list already listed by the Society as standard. These are two bronzes, the first of which is intended for valves, light gears and the like. The composition follows:

Copper	87 to 89 per cent.
Tin	9.5 to 10.5 per cent.
Manganese	1.5 to 2.5 per cent.

The other alloy submitted by the Division was for a gear bronze, which is similar to the English gear bronze and it is recommended for its quiet running. Its composition is given:

Copper	88 to 89 per cent.
Tin	11 to 12 per cent.
Phosphorus	0.15 to 0.30 per cent.

Report of the Broaches Division

In speaking of the work of this division, Chairman Souther stated that its work is progressing just as it should. His only criticism of the report was as to the close limits set for the amount of copper in the gear bronze, namely the restricting of the limits between 88 and 89 per cent. He questioned the advisability of fixing such close limits if there were any possibility of such restriction affecting the manufacturing cost of the alloy. However, members of the division assured the chairman that such close limits of apportionment would not be very difficult of attainment and that they would not cause any rise in the commercial market price of the alloy. The report was then accepted and its submission to the Society directed.

Chairman C. W. Spicer, of the Broaches Division, submitted a short report of the work of his committee since the last session of the society. It is essentially a report of progress, he said and while the division has no new data to proposed at this meeting of the society, nevertheless there are a number of special considerations to be brought up. The hobbing of splined shafts was touched upon and the machining of these shafts in this way was characterized as a step forward in their manufacture.

There was no discussion of the Broaches Division report, Mr. Souther stating that the manufacture of broaches is still in the process of evolution and that any more definite report by the Broaches Division at this time would not be advisable on this account. It was, therefore, passed to the society as read.

A new division on Motor Testing was created at the last summer meeting of the society with J. O. Heinze as its chairman. While in operation only 3 months the activities of the division have been very marked and Mr. Heinze spoke very interestingly of what has been done. A number of diagrams were submitted showing installations of apparatus as used at the Northway plant in Detroit by Mr. Heinze for the determination of various data in connection with motors.

Although Mr. Heinze stated that the work of his committee has not progressed rapidly enough to make his report a basis for motor testing, a very clear and comprehensive foundation has been laid for a line of standardization of motor testing which will be of undoubted benefit to every member of the society interested in motor manufacture and testing. The division is endeavoring to fix upon and develop those tests which should prove of greatest practical value rather than striving for scientific accuracy. Several questions were submitted by Mr. Heinze in order to determine the policy of the division. Should the division specify just what procedure should be followed in making a test as to the arrangement of the apparatus and the sizes of the dynamometers and other instruments or should these points be left to the engineer making the tests? Should certain testing instruments be made standard by the division? Should the division fix upon what tests are important and direct their use? Should there be standard curve and data sheets printed by the society and distributed to members so that comparative results could be determined?

In fact Mr. Heinze stated that the whole matter is yet up for discussion and he solicited the fullest criticism and suggestion from the members as a whole. In order for the division to arrive at any conclusive and definite results for the approval of the society it must have more time for its work. Three months is a short period for any concrete ideas.

A sample curve and data sheet which was drawn up by Mr. Heinze was submitted. On this sheet it was proposed to include the specific gravity of the fuel, various necessary temperatures, barometric reading, the kind and size of motor under test, the type of dynamometer used, the carbureter and the magneto makes. Below spaces for this data the curves were drawn. In connection with the sample curves shown, it was brought out that it is a question as to what curves are of sufficient importance to be plotted. Should only the indicated horsepower curve be submitted or should curves of volumetric efficiency, air consumption of the motor with and without the carbureter, torque, gasoline consumption and the like be added. It is a question as to just what points would be of greatest assistance to the society at large.

The several charts showing suggested arrangements of apparatus were next touched upon by Mr. Heinze and while in each case the layout depicted only one arrangement for the determination of any one factor, there are of course a number of other arrangements which would probably work equally as well. Those shown in each case embodied the schemes employed at the Northway plant and are the ideas of Mr. Heinze. One cut showed the method of arriving at air and gasoline consumption; another for accurately fixing the timing. In his tests of this nature Mr. Heinze eliminates the primary timing and works upon the secondary spark in an effort to dispose of the errors of secondary spark ignition. It is advisable not only to determine the position of the secondary spark but also to arrive at the heat units of the spark and for that purpose another proposed method of determination was submitted. It is also necessary to measure the vibration of motors. All have a critical speed at which they have their greatest period of vibration and this should also be determined. An arrangement of apparatus by which the engine under test is mounted upon a set of springs and its vibration amplitude at various speeds determined was next shown. Another proposed test is in order to measure the acceleration of carbureters. Some instruments accelerate better and more steadily than others and it is important for the engineer to be able to determine that device best fitted to the engine which he manufactures. The proposed arrangement for such determination was pointed out to consist essentially of a drum rotated by a descending weight and so connected as to gradually open the carbureter throttle as the weight lowers. Cylinder compression should be measured also, and further, manograph curves should be obtained. As scheme of obtaining such curves was shown in which the standard reflecting type was somewhat modified so as to eliminate the objectionable feature, i.e., the long air pipe.

A scheme of test was also illustrated by means of which the radiator maker could design his product for certain size motors with acccuracy.

Sheet Metal Division's Work

T. V. Buckwalter, chairman of the Sheet Metals Division, next presented the report of his committee. The work divides itself into two heads, he said. The first of these comprises the submission of specifications for sheet metal materials while the second refers to the specifications for dimensions for these materials. He advocated the standardization of gauges. It is first necessary to know what sizes of sheets and rods are used by the manufacturers before it is possible to arrive at what standards to recommend. For this purpose sheets have been prepared by the division to be sent to the various members of the society on which they are requested to signify these sizes. It is hoped that the returns on this matter will be complete enough at the time of the summer meeting so that a concrete report may be sub-

mitted then. Specifications for manganese bronze were submitted by the division as follows:

Copper	56 to 60	per cent.
Tin	0.50 to 1.50	per cent.
Iron	0.50 to 1.50	per cent.
Manganese	0 to 0.75	per cent.
Lead impurities	Not to exceed 0.25	per cent.
Zinc		Remainder.

In thus submitting the formula for this metal, the committee has endeavored to tie the specifications down to chemical combinations rather than to chemical and physical combinations, according to Mr. Buckwalter.

There was some difference of opinion as to whether this specification belonged rightfully in the reports of the Sheet Metals Division or whether it should be included in the list of alloys standardized by the Alloys Division. Inasmuch as it is not intended to be a formula for cast bronze, W. R. Webster stated that it should stay where it was. The question was merely one of reference. The engineer would naturally look under alloys for this composition, Mr. Souther thought. He finally proposed that the specification be listed in both places, which cleared the discussion and allowed the report to be passed to the society.

The work of the Truck Standards Division since the last session was next gone over by its chairman, W. P. Kennedy. The report this time was not very extensive for the reason that returns from all the manufacturers on the questions asked have not been received, although the blanks sent out have been replied to by the majority of the large manufacturers. As was pointed out at last summer's meeting and again emphasized by Mr. Kennedy on Wednesday, the information requested of the truck makers is not for publication but is required for use in determining the standards. Although unprepared to present definite standards on any parts as yet, it is the sense of the committee that it should proceed slowly to fix a number of the more important points such as the size of motors in relation to load carrying capacities and the tire sizes for different loads and capacities. If five or six such main points are determined, the division will have gone as far as it can proceed as a first step. The report was referred to the society.

Mr. Kennedy is also chairman of the Wheel Dimensions and Fastenings for Tires Division, the report of which he next presented. This is the fourth report of this division, the work of which has been characterized as the masterpiece of the society. The report of this division follows:

S. A. E. Standard Motor Truck Wheel

Edges of Permanent Metal Felloe Band

"We recommend that the permanent metal felloe band be rounded on the two outside edges with the radius not to exceed 1-16 inch, and that one inside edge of the band have an angle of about 45 degrees, extending about 1-16 inch from the edge.

Tolerance in Width of Permanent Metal Felloe Band

"We further recommend that the previous recommendation as to tolerance in width of permanent metal felloe band be modified to read as follows:

	Plus	Minus
Tolerance in width	1-64 inch	1-64 inch

"And, in consequence of the last mentioned above recommendation, that the previous recommendation as to trueness of band when placed on surface plate be modified to read as follows:

Either side of the band when laid on a surface plate must not clear more than 1-64 inch at any point.

Tolerence in Circumference of Permanent Metal Felloe Band

In June, 1911, the Division voted that the tolerance in circumference should be:

	Plus	Minus
Before application to wheel	1-16"	0
After application to wheel	1-8"	0

In February, 1912, the Division, in view of the then more extensive manufacture of rigid-base tires, recommended that the circumferential tolerance should be:

	Plus	Minus
Before application to wheel	1-32"	1-32"
After application to wheel	1-16"	1-32"

Both of these recommendations were accepted by the Society, the latter, of course, superseding the former.

In this connection the point has been made by wheel manufacturers that if the 1-32" plus tolerance be taken up in the manufacture of the band, the wheel manufacturer has left to him only one-half or 1-32" of his 1-16" plus tolerance in the application of the band to the wheel.

The first view of the Committee at its meeting of November 13, 1912, was that no change in circumferential tolerance should be recommended until a greater demand for such change should be evident. After a long discussion, however, upon notice, duly seconded, it was

Voted that the last mentioned above tolerance in circumference of permanent metal felloe band should be modified to read:

	Plus	Minus
Before application to wheel	0	1-16"
After application to wheel	1-16"	1-32"

Measuring Circumference of Bands

In measuring circumference of the band, if there is no allowance on the tapeline itself, a correction amounting to three times the thickness of the tapeline should be made.

A rather prolonged discussion of this paper was held. Bert Morley, of Kelsey Wheel Company, stated that his concern has held close to the S. A. E. recommended limits since last fall. He brought up the advisability of machining bands of 6 inches or under and recommended that this not be done. F. H. Moyer, of the Firestone company, was particularly opposed to this machining although he stated that the Firestone company has had no trouble in adhering to the dimensions adopted as the result of the division's recommendations. While he stated that it is perfectly possible to machine the bands, it certainly adds to the cost of production and questioned if the increased cost is compatible with the benefits derived from the requirement. O. W. Mott, of the Jackson Rim Company, is also opposed to machining bands unless absolutely necessary, although he stated that it could be done, of course, at somewhat extra cost. Is such accuracy necessary and does it pay in the increased life of the tire, was asked. Mr. Kennedy stated that this requirement had been recommended only after urgent pressure had been brought to bear by the majority of the tire people. Although not unanimously in favor of it, he said that his committee had to be governed by the desires of the majority. Inasmuch as there was such a difference of opinion on this point he suggested that its adoption be suspended until the summer meeting.

Chairman Souther then took up the internal strife at present existing among the members of the United Rim Association and pointed out that this organization is soon to be disrupted with the result that the market will be flooded with many types of rims. There are at present about five types of quick detachables and as many demountables. With this situation in view it is now the psychological moment for the society to step in and standardize this product. Accordingly he proposed the formation of a committee to deal with the subject which would be so constituted as to be unbiased in its views. It was finally voted by the standards committee to recommend to the council the widening of the scope of the recently formed Wire Wheels Division so as to deal with the situation. It was suggested that the name of this division be changed from wire wheels to Pleasure Wheel Division.

Of particular interest at this time was the report of the Division on Lamp Standards by Chairman Palmer. The relative advantages of the grounded and ungrounded returns for lighting systems commanded attention on account of the rapid development in electric lighting recently. It was brought out that the grounded return provides bigger contact points and better insulation of the lamp receptacles. Further with grounded returns there are fewer connections at the switch; that an ordinary system involving head, side and tail lamps has eleven connections with the grounded as against fourteen with the ungrounded system.

As to the advantages of the ungrounded return they all hinge on the fact that accidental grounds on the battery side of a grounded return system short-circuits the current and damages the battery; whereas in the ungrounded return system it would be necessary to ground both sides of the circuit simultaneously. With grounded systems horns and other dash electric devices must be carefully insulated from the metal parts of the body. No definite recommendation was made on this point.

This report recommended that standard electric light bulbs be known as 7-volt bulbs and have an efficiency of 1.1 watts per candle at voltages between 6.5 and 7 volts. Standard electric headlights are to be 2 1-16 inches diameter size and capable of being focused in a reflector of 7-8 inches or greater focal length. An effort is being made to get data from battery makers from which to specify standard dimensions of batteries and plates, giving three standard plate sizes from which batteries of any capacity can be made by increasing the overall battery length.

Chairman Riker of the Miscellaneous Division mentioned work on method of designating gear ratios. His report dealt chiefly with yoke and rod end sections.

The use of low grade fuel for motor trucks was discussed by N. B. Polk, who considered different types of fuel such as kerosene, distillate and naphtha as substitutes for gasoline and suggested the requirements of carbureter for the purpose and also gave some hints on overcoming the difficulties of hard starting. Mr. Polk's paper precipitated a lively discussion on engine fuels and particularly the change in the grade of gasoline during the past few years. As an outcome it is probable that a committee will be appointed to seriously consider the gasoline problem and its effect on the industry as a whole.

Paper on Brakes Read at Indiana S. A. E.

INDIANAPOLIS, IND., Jan. 13—A paper on the subject of Brakes was read by Professor C. B. Veal, of Purdue University, Lafayette, at a meeting of the Indiana Section of the Society of Automobile Engineers, held at the Claypool Hotel in this city last Tuesday night.

Professor Veal is identified with the mechanical engineering department and testing department at the university and is recognized as one of the most able experts in engineering matters in the state. His views on the subject of brakes were therefore received with considerable interest. Professor Veal urged the necessity of applying the standard practice to brake construction and complimented Indiana manufacturers highly.

Packard Has Big Year

Gross Earnings for Current Year Were $3,412,862.05—Firm's Gross Sales Have Increased to $14,613,057.27

Capital Stock of Packard Company Is $10,000,000 which Is Equally Divided Between Common and Preferred

DETROIT, MICH.—In a report just issued by Henry B. Joy, president of the Packard Motor Car Company to the directors of the company for the fiscal year ending August 31, 1912, it is shown that the concern's gross sales including commercial vehicles have increased from $11,624,588.37 in the previous year to $14,613,057.27 in the year covered by the report. The gross earnings for the current year were $3,412,862.05. Deducting from this the depreciation of buildings, machinery, tools and development leaves net earnings for the year of $2,182,376.20. Subtracting the dividends upon the preferred stock, which amounted to $350,000, the net surplus for the current year is $1,832,376.20, which amount swells the total surplus (considering that which was on hand at the beginning of the fiscal year) to $4,816,398.01. From this total the Board of Directors has authorized deductions to reduce the amount at which "rights, privileges, franchises, etc.," be carried on the books from $3,274,958.89 to $1.00 and to adjust the books to the inventory taken December 31, 1911, by the charging off of $342,656.30, leaving a final net surplus on August 31 last of $1,198,783.82.

The capital stock of the Packard company is $10,000,000 which is equally divided between common and preferred. In the general balance sheet, the resources include real estate valued at cost at $285,312.49, buildings at $2,084,865.81, machinery at $1,145,381.22, and material stock, consisting of raw materials, that in process of construction and finished vehicles, of $5,351,217.23. In the above items depreciation has been deducted from buildings and machinery.

In submitting the report, Mr. Joy points out that wages have constantly increased during the year and that they are higher than ever before, they being higher in Detroit than in other cities investigated. The increased volume of Packard business is shown to be made possible by the new scheme of manufacture now in force. The former endeavor was to bring out of the engineering department two models of chassis of two sizes at the same time to be turned over to the manufacturing department simultaneously in order to have them ready for the market at the same time, both models thus going along together through the factory. This has proven impracticable for many reasons, and causes delayed deliveries and restricted output. Under the present scheme, one model of chassis is developed and manufacturd at a time and offered to the market when ready. Thus the Packard "38" came on the market this fall and winter, and the "48" will be submitted to the trade next spring and summer.

No dividends on the Packard common stock have been paid for the last 3 years, all earnings in excess of the preferred stock dividends going into the capital account. Mr. Joy states that he feels confident the current year will see a resumption of payments of a small dividend rate on the common stock, although the largest share of the earnings must, however, be added to the working capital to meet added requirements of increased volume of business.

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The Indiana Automobile Manufacturers' Association, which journeyed from the Hoosier capital eighty-five strong in a special train to the shows, held a shore dinner Sunday afternoon at Coney Island which over 100 attended. The occasion was exceedingly enjoyable, according to the diners.

Automobile Securities Quotations

Tendencies in the automobile stock market were slightly upward this week, with few exceptions. Consolidated common was a feature, scoring a ten-point advance over last week; Peerless and Swinehart advanced likewise, and the same holds good of International Motor common and Chalmers. Alco common and Goodrich common fell off slightly. Generally speaking, the tone of trading was firm and the volume of transactions fair. Willys-Overland stock was strong and advanced slightly during the week. The table follows:

	1911		1912	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	180	200
Ajax-Grieb Rubber Co., pfd	..	..	95	101
Aluminum Castings Co., pfd	..	..	98	101
American Locomotive, com	34	35	40	41
American Locomotive, pfd	103	103½	104	106
Chalmers Motor Company	..	..	130	145
Consolidated Rubber Tire Co., com	5	12	14	16
Consolidated Rubber Tire Co., pfd	10	25	60	70
Firestone Tire & Rubber Co., com	178	185	328	332
Firestone Tire & Rubber Co., pfd	108	110	105½	107
Garford Company, preferred	..	..	100	102
General Motors Company, com	35	36	33½	34½
General Motors Company, pfd	77	78	76	78
B. F. Goodrich Company, com	..	..	62½	63
B. F. Goodrich Company, pfd	..	..	105	105½
Goodyear Tire & Rubber Co., com	252	258	440	450
Goodyear Tire & Rubber Co., pfd	104	106½	104½	106
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	5	15
International Motor Co., pfd	..	..	40	60
Lozier Motor Company	..	..	25	35
Miller Rubber Company	..	..	165	170
Packard Motor Company, pfd	..	..	103	105
Peerless Motor Company	..	..	120	125
Pope Manufacturing Co., com	40	44	34	35
Pope Manufacturing Co., pfd	67	70	79	80
Reo Motor Truck Company	8	10	10	10½
Reo Motor Car Company	23	25	20¼	20¾
Studebaker Company, common	..	..	32	35
Studebaker Company, preferred	..	..	92	94½
Swinehart Tire Company	..	..	110	112
Rubber Goods Mfg. Co., pfd	100	105	105	107
U. S. Motor Company, com	..	..	..	..
U. S. Motor Company, pfd	..	..	..	..
White Company, preferred	..	..	105½	107
Willys-Overland Co., com	..	..	73	74½
Willys-Overland Co., pfd	..	..	99	109

Weed Patents Again Upheld

Preliminary Injunction Granted

CHICAGO, ILL., Jan. 11—Again affirming the validity of the Parsons chain-grip patents, under which the Weed Chain Tire Grip Company is the sole licensee, the United States Circuit Court last Tuesday upheld the claims of the Weed interests in the appeal by the H. Channon Company from the District Court. A preliminary injunction was granted as a result of the original hearing before Judge A. L. Sanborn on April 25. The appeal hearing was granted for the October session of the October term of the United States Circuit Court of Appeals, Judges Baker, Seaman and Kohlsaat sitting. In the decision handed down by Judge Baker the following evidence was considered: That the Parsons patent, No. 723,299, relates to an anti-skidding means held across the tire by two rings, of smaller diameter than the tire, but held so loosely that the anti-skidding means may travel circumferentially around the tire, and thus not injure the tire, as would anti-skidding means held rigidly on the tire. The appellants held that, whereas the Channon device employed a means of attaching the side-rings securely to the tire, so that the anti-skidding means would not creep on the tire, and it was sold with instructions that it be so used, it was not an infringement on the Weed device.

The court ruled, however, that, whereas the device manufactured by the Channon company was identical with the Weed device, except in this particular, the securing means was a cover and a sham, and that as the creeping ability of the original device was desirable, the user could innocently remove the securing means to protect the tire; and that, therefore, the Channon device was an infringement.

Market Changes for the Week

The feature of interest in tin in the domestic market yesterday was the advance of $.25 per hundred pounds, the holders of supplies taking advantage of light stocks and the consumers' needs to force the rise. Bessemer steel and open-hearth steel each experienced a rise of $1.00 on Thursday, due to good trading conditions. The copper market was demoralized yesterday with speculators operating feverishly in standard warrants and both domestic and foreign consumers remaining out of the market temporarily. Copper electric suffered a loss of $.00 7-8 per pound and copper Lake $.00 3-4. Lead was dull but steady, remaining at $4.30 per hundred pounds throughout the week. Linseed oil and cottonseed oil experienced change in prices, linseed oil a gain of $.01 and cottonseed oil a loss of $.10.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, per lb..	.08¾	.08¾	.08¾	.08¾	.08¾	.08¾	....
Beams & Channels, per 100 lbs.....	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, Pittsburgh, ton..	27.50	28.50	28.50	28.50	28.50	28.50	+1.00
Copper Elec., lb..	.17½	.17¼	.17¼	.17⅛	.16⅞	.16⅝	— .00⅞
Copper, Lake, lb.	.17¾	.17½	.17⅜	.17⅜	.17¼	.17	— .00¾
Cottonseed Oil, Jan., per bbl...	6.18	6.16	6.12	6.05	6.07	6.08	— .10
Cyanide Potash, lb	.19	.19	.19	.19	.19	.19	....
Fish Oil (Menhaden), Brown....	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 lbs. @.....	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime...	.90	.90	.90	.90	.90	.90	....
Lead, 100 lbs.....	4.30	4.30	4.30	4.30	4.30	4.30	....
Linseed Oil, prime	.46	.46	.46	.46	.46	.47	+ .01
Open-Hearth Steel, per ton........	28.00	29.00	29.00	29.00	29.00	29.00	+1.00
Petroleum, bbl., Kansas crude...	.83	.83	.83	.83	.83	.83	....
Petroleum, bbl., Pa. crude......	2.05	2.05	2.05	2.05	2.05	2.05	....
Rapeseed Oil, refined....	.69	.69	.69	.69	.69	.69	....
Silk, raw Italy....	....	4.35	....	....	4.35	4.35	....
Silk, raw Japan...	....	3.67½	....	....	3.72½	3.77½	+ .10
Sulphuric Acid, 60 Beaumé.....	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb......	50.50	50.35	50.25	50.20	50.15	50.75	+ .25
Tire Scrap.......	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	....

Now Maxwell Motor Co., Inc.

New Company Takes Over U. S. M.

On Thursday, January 9, Judge Hough, of the United States District Court for the Southern District of the State of New York, ordered the sale of the assets and good will of the United States Motor Company and its subsidiaries to the reorganization committee under condition that the committee agree to pay all unpaid expenses and obligations incurred by the receivers in the administration of the properties, all compensation to receivers and ancillary receivers and their attorneys, and the following percentages on all claims as finally adjudged against the following companies: United States Motor Company, 32.5 per cent.; Alden-Sampson Company, 24 per cent.; Brush Runabout Company, 33 per cent.; Columbia Company, 91 per cent.; Dayton Company, 39 per cent.; Maxwell-Briscoe Company, 60 per cent.

The Standard Motor Company was incorporated January 11 under the laws of Delaware, with a capital of $31,000,000 to take over the property and business of the United States Motor Company. As the name of this organization was found to conflict with the names of other companies, the name was changed on Monday, January 13, to the Maxwell Motor Company, Inc. The Delaware incorporation stands.

Judge Hough signed the order transferring the property of the United States Motor Company to the new company on Saturday. The transfer of the property was effected on Monday. The legal representatives of the new organization state that at the present time 98 per cent. of the company's indebtedness is paid up. They predict that the company's affairs will probably be in a more or less settled condition by February 15.

Empire Tire Busy Again

On January 2, $1,000,000 Worth of Stock Issued and Sold to Creditors—No Settlement of Liabilities

Turns Out 2400 Inner Tubes and 700 Casings a Day—Export Trade Amounts to 365,000 Tubes a Year

AFTER it had been announced some time ago that the Empire Tire Company, Trenton, N. J., had been dissolved, it is now becoming known that this was not so. The company which, like the Empire Rubber Manufacturing Company of the same city, is practically controlled by General Edward Murray, was consolidated with the latter concern about December 1. At that time, the liabilities of the Empire Tire Company were $300,000 and the quick available assets $1,200,000, but the company suffered from a shortage of cash with which to carry on its business. It was on this account that on January 2 $1,000,000 worth of stock, half common and half preferred, was issued and sold, partly to the creditors, but was not offered to them as a settlement of the company's liabilities. These creditors, who were largely firms supplying the Empire Tire Company with raw materials, were invited to subscribe to 90 per cent. of the stock issue and the stock was sold at a little below par value.

With the ample capital now on hand, the Empire plant turns out 2400 inner tubes and 700 casings a day, according to the New York sales manager of the company. An increasing percentage of this output consists in red rubber tubes and casings. The export trade of the firm, which is given considerable attention, amounts to a very high portion of its total business, there being a total export of 365,000 tubes a year. In addition to continuing its former line of products the Empire company has begun to manufacture a non-skid tread casing, the projections of which are oblong and 3 inches in length, arranged longitudinally on the casing surface proper.

Keeton Company Buys Oliver Plant

DETROIT, MICH., Jan. 14—The property at Breckenridge street, Lawton avenue and the Michigan Central tracks, formerly occupied by the Oliver Motor Truck Company, has been purchased by the Keeton Motor Car Company at a purchase price of $50,000. In the group of buildings are three of modern factory construction, 220 by 80 feet each, and one building 140 by 80 feet. A fifth building 110 by 80 feet will be added at once.

Streator's Personal Property Sold

CHICAGO, ILL., Jan. 15—*Special Telegram*—All the personal property of the Streator Motor Car Company, Streator, Ill., manufacturer of Halladay cars was sold yesterday at auction to the Merchants' Realization Company, of Chicago. The price paid was $56,000 which included all cars and those in the course of construction, together with the machinery contained in the plant. The sale is to be confirmed by the court sometime during the week of January 20 and in the event that the court should call the sale void the property will be reauctioned immediately. Also it is expected that the entire plant will be sold, including personal and real property. As yet no bids have been received for the latter but disposition will probably be made of it soon.

Swinehart Resigns—C. A. Swinehart has announced his resignation as sales manager of the Swinehart Tire & Rubber Company, to take effect February 1. Although his plans for the future have not been definitely decided upon, he will continue in the tire business.

Hartz Succeeds Hupp As R. C. H. President

Vice-Presidency Taken by Former President—Seider, Secretary—Board of Directors Elected

Dealers in Forty-Two Foreign Countries Ordered 1,200 Cars—Last Year Over 7,000 Cars Were Sold

DETROIT, MICH., Jan. 13—At the meeting of the R. C. H. Corporation, J. F. Hartz, of Detroit, became president and treasurer of the concern, succeeding R. C. Hupp, who was elected vice-president. C. P. Seider, formerly vice-president, is now secretary. The company at present has on its books orders from American dealers for 15,000 cars. Dealers in forty-two foreign countries have ordered 1,200 cars. Last year more than 7,000 R. C. H. cars were sold.

Mr. Hartz, the new president and treasurer, is very well known to the business interests of Detroit, being president of the J. P. Hartz Company, president of the C. M. Hall Lamp Company and vice-president of the Williams Brothers' Company.

Besides the officers the new board of directors of the R. C. H. Corporation comprises G. W. Rogers and J. G. Robertson, of Akron, O.; John Kelsey and Joseph H. Clark, of Detroit; G. Jahn, of New York, and C. C. McCutcheon, of Jackson, Mich. January 1 Peyton R. Janney, formerly of the General Motors staff, became general manager, retaining Fred R. Bump as assistant general manager.

Automobile Insurance Takes New Form

The Maryland Motor Car Insurance Company, Baltimore, Md., and New York City, which for some time has issued separate policies for liability, car loss, accidents and fire, has combined with the United States Fidelity & Guaranty Company, New York City, for the issue of a combination policy covering all these possibilities. While the rates are not influenced by this arrangement, it serves to simplify the handling of insurance for the broker as well as for the holder of a policy. Under the arrangement, the user of a policy has the option of separate insurance for any of the above subjects or of a joint policy. The separate insurance business is so being shared between the Maryland and the U. S. Fidelity company that the former specializes on fire insurance and the latter of liability.

Texas Increases Freight Charges

AUSTIN, TEX., Jan. 13—The State Railroad Commission has issued an order amending its circular relating to the transportation of baggage from passenger trains in this state, so as to provide that automobiles shall not be accepted as baggage in regular baggage cars, but they may be transported in extra baggage cars at additional compensation. A charge of 10 cents per mile for automobiles or other motor vehicles, with a minimum of $5 for each automobile, in addition to the regular charges for extra cars, is provided. The order will become effective January 20.

Aluminum Companies in Combine

WASHINGTON, D. C., Jan. 15—At a session of the House Committee on Ways and Means on January 14, President Arthur V. Davis, president of the Aluminum Company of America, admitted that his company, the only aluminum factory in the United States, owns the Canadian Aluminum Company, which in turn had agreements with each of the seven foreign aluminum companies. This agreement embraces the aluminum industry of the world, with the exception of the United States. This country is excepted, according to Mr. Davis, due to the Sherman anti-trust law.

President Davis testified that the total surplus of the company is $12,000,000 and that the company is capitalized at $30,000,000 on which dividends are being issued at 4 per cent. on the capital stock. During the past three years the concern has been earning annually from 15 to 17 per cent. It was brought out that of the $30,000,000 of capital, only $1,860,000 was actually paid in, the remainder representing earned profits. Davis protested against any reduction of the tariff on aluminum and denied that his company exported any of the metal.

$100,000 for Cheap Fuel

PARIS, Dec. 24—Seriously alarmed at the increasing cost of gasoline, the International Association of Recognized Automobile Clubs, at its meeting here, decided, on the proposal of René de Knyff, to offer a prize of $100,000 for the best alternative fuel for use in existing internal-combustion motors. The regulations of the competition have yet to be drawn up and will not be made public until a promise has been obtained from the governments of the interested countries that the new fuel will be either free from taxation or admitted at a very low fixed tax. The fuel must be available in big quantities, and must be of such a nature that it cannot be monopolized by trusts.

The countries represented at the conference were France, Great Britain, Germany, Austria, Belgium, Denmark, Holland, Hungary, Italy, Russia, Switzerland, Sweden, Egypt, Roumania and America. The American delegates were George Heath and William S. Hogan. The national clubs of these nations have agreed to raise the sum of $100,000 for the fuel prize.

Tone Corporation Seeking Factory

INDIANAPOLIS, IND., Jan. 13—The Tone Car Corporation, organized in Indianapolis some time ago to manufacture a line of motor cars, has submitted a bid of $100,100 for the plant of the T. B. Laycock Manufacturing Company, which is in the hands of a receiver. It is understood, however, that the court will order the receiver to reject the bid, on the ground that it is too low. Fred I. Tone is president of the Tone company, which hopes to find a location soon so that active operations may be started.

Toner Leaves Flanders Company

DETROIT, MICH., Jan. 13—Thomas Toner, assistant sales director of the Flanders Motor Company, has resigned. His successor has not been chosen as yet. Mr. Toner says he has several offers under consideration, but has not decided anything definitely except that he will stick to the automobile business. He declares he has not had a vacation in 7 years and that he will take a good rest before going to work again.

The Drouet-Page Company has been formed to handle the Palmer-Singer cars in New York, Brooklyn and Westchester. Henry Drouet is president and Fred H. Page, sec-treas.

The New York bankers are selling at 100 and accrued dividends $1,000,000 worth of the 7 per cent. cumulative preferred stock of the recently formed Stewart-Warner Speedometer Corporation. Financial statements place the combined net earnings for last year of the Stewart and Warner companies in excess of $925,000.

London Rubber Sale Opened

The leading event in the crude rubber trade during the last week was the opening of the fortnightly sale of plantation grades in London. There was a good demand and the sale started at firm prices, but later on an easier tone developed.

127,287 Automobiles Manufactured in 1909

Government Census Report Shows Production for That Year To Be Thirty Times That of 1899

U. S. Post Office Department To Take Bids for 100 Additional Motor Vehicles For Parcels Post Service

WASHINGTON, D. C., Jan. 11—An abstract of the full census report has just been issued by Director Durand, in which he makes the following report relative to autcbiles:

"The growth of the automobile industry has been phenomenal. In 1899 the general statistics for the industry were included with those for carriages and wagon manufacture, and only 3,897 automobiles were reported. In 1904, the total number, including automobiles made by the concerns classified under other industries, was 22,830, while in 1909 the number was 127,287, or nearly thirty times the number reported in 1899. The value of all products of the industry proper was $249,202,075 in 1909 and $30,033,536 in 1904. Gasoline machines formed 95.1 per cent. of the total number made in 1909 and 86.2 per cent. in 1904. Of the total manufactured in 1909, 3,226, or 2.5 per cent., were rated at 50 horsepower or more; 51,218, or 40.5 per cent., at from 30 to 49 horsepower; 35,257, or 27.8 per cent., at from 20 to 39 horsepower; 29,353, or 23.2 per cent., at from 10 to 19 horsepower, and 7,539, or 6 per cent., at less than 10 horsepower. Passenger vehicles constituted 97.4 per cent. of the total number and business vehicles 2.6 per cent.

In addition 694 automobiles, valued at $830,080, and bodies and parts, valued at $4,415,266, were made by establishments engaged primarily in the manufacture of products other than those covered by the industry designated.

U. S. to Buy 100 More Trucks for P. P.

WASHINGUTON, D. C., Jan. 15—Postmaster General Hitchcock decided today to take in bids for the U. S. Mail department, on 100 trucks suitable to take care of the rapidly increasing parcels post work in cities. All these trucks will be painted red, which color is to be adopted as standard for postal vehicles.

Reports from forty-eight representative post offices show that for the first week of the parcels post system, from January 1 to 7, a total of 1,989,687 pieces of matter were handled by these offices. No estimate of the receipts in money have yet been made, but officials at Washington state that the new system has already exceeded all expectations. During the first week 76,500 incoming packages were received at the New York office, while 371,800 outgoing parcels were handled, bringing the total to 448,300. Naturally, this was the greatest amount of business done by any city. Chicago comes next with 438,000 pieces handled; Philadelphia reports 146,595, while Jersey City totaled 60,000.

With such a large amount of business when the system is yet in its infancy, there can be no doubt of the benefit which makers of light and medium commercial vehicles will derive from the project when it actually gets under way.

Court Holds Prest-O-Lite Patents Dead

CHICAGO, ILL., Jan. 8—Decision was rendered yesterday in the United States Circuit Court of Appeals, Seventh Circuit, against the Presto-O-Lite Company, of Indianapolis, in the appeal of the patent infringement suit filed by them last spring in the Circuit Court, as it was defeated last June. The original suit was denied in the United States Circuit Court by Judge Kohlsaat and the present suit is an appeal to the Circuit Court of Appeals by the Indianapolis interests. The case was heard by Judges Baker, Seaman and Humphrey and the former decision was affirmed in the decree handed down yesterday by Judge Humphrey. Attorneys Weinter, Bartlett and Hamill represented the Prest-O-Lite company and Parkons and Lane defended the Searchlight company. The suit was brought by the Commercial Acetylene Company, holder of the Claude and Hess letters patent No. 664,383 and the Prest-O-Lite Company, sole holders of license from the Commercial Acetylene Company to manufacture under the Claude and Hess patents. These patents refer to a closed vessel, containing a supersaturated solution of acetylene gas supplied with a reducing valve for the release of the gas at substantially uniform pressure, and expire on their face December 5, 1917, after considerable favorable litigation, starting February, 1909, in which the Avery Portable Light Company, of Milwaukee, was restrained from further manufacture and sale of its product, followed by similar action against the Auto Tank Manufacturing Company, the Acme Acetylene Appliance Company and the Des Moines Auto Gas Company. Judge Kohlsaat rendered the first decision against the Prest-O-Lite interests in refusing to grant a motion for a preliminary injunction against the Searchlight Gas Company on April 26, 1912. He ruled that the American patents had expired by reason of the expiration of the British patents held identical with the Claude and Hess patents. The Prest-O-Lite company then brought suit in the Circuit Court, charging infringement, and was defeated again. In the appeal just decided the defendant claims non-infringement on the grounds of the expiration of the British patents.

Michigan Wants Better Gasoline

DETROIT, MICH., Jan. 12—Every Michigan automobile owner is interested in a bill prepared for the Legislature by Representative L. J. Wolcott, of Albion. The bill is aimed to regulate the sale and quality of gasoline in Michigan. It provides for a specific gravity of at least 60 degrees Beaumé for all gasoline and the labeling of all containers with the specific gravity of the gasoline they hold. All below 60 degrees must be labelled "naphtha." The bill also provides for state inspection of all gasoline, the law on the statute books at present providing only for the inspection of kerosene. The fact that the price of gasoline in Michigan has been increased from 10 cents per gallon to 15 1-2 cents per gallon in the last year without any increase in the quality is given by Representative Wolcott as his reason for the bill. He declares at the present time much of the gasoline being sold in the state is no better than naphtha.

Government Truck Contracts Awarded

WASHINGTON, D. C., Jan. 11—After having the bids under consideration for nearly 2 months the general supply committee has awarded the following contracts for furnishing motor trucks to the government during the balance of the fiscal year: The White Company, Cleveland, O., 1,500-pound and 2,000-pound trucks, $1,950; 3,000-pound trucks, $2,750. The Hupp Motor Car Company, Detroit, 1,000-pound trucks, $950. It is expected nearly a dozen trucks will be purchased under this contract, and at its expiration it is likely new bids will be invited. The trucks will be used in Washington.

Franklin Capital Jumps to $1,500,000

SYRACUSE, N. Y., Jan. 13—The capital of the H. H. Franklin Manufacturing Company has been increased from $300,000 to $1,500,000 which consists of 9,000 shares of common stock and 6,000 of 7 per cent. cumulative preferred stock.

A.A.A. Committee Meets

President Enos Recommends Appointment of Committee on National Reliability Tour of Commercial Vehicles

Next Annual Meeting of the Association to Take Place in Richmond—Date To Be Decided in June

AT Tuesday's meeting of the executive committee of the American Automobile Association two resolutions were read and approved from President Enos, who was too ill to attend, one of these being a recommendation to appoint a committee to take up with the National Association of Automobile Manufacturers the subject of a national reliability tour of commercial vehicles during the coming summer; and the other to appoint a committee on the subject of the national reliability tour of passenger vehicles. The outcome of the tour of commercial vehicles will largely depend on how the suggestion is received by the manufacturers. It is more than possible that the national passenger vehicle tour for this year will not be over the course laid out for last season, namely, from Detroit to New Orleans. At present Minneapolis is bidding for the tour with the object of running it from the Twin Cities to the Black Hills of Dakota and return. Dr. Dutton, president of the Minnesota state association, is fathering the movement.

Ex-President Hooper was presented with a gold watch, in appreciation of services rendered.

Preston Belvin of Richmond, Va., asked that the annual meeting of the association, which will take place in Richmond during the coming fall or winter, be held between November 1 and 15 instead of in December as at present. The matter will be decided at the semi-annual meeting to be held in Philadelphia in June. Mr. Belvin also moved for a consolidated tour at the time of the annual meeting, the tourists from all sections meeting in Richmond and spending a week there for the meeting.

Big Matheson Agency for Canada

MONTREAL, CAN., Jan. 11—The organization has just been completed of the Matheson Automobile Company of Canada, Ltd., incorporated with a fully paid capital of $50,000, all of which is common stock. The company is the Canadian distributor of two makes of automobiles manufactured in the United States, namely, the Matheson Silent Six, manufactured at Wilkes-Barre, Pa., by the Matheson Automobile Company, and a line of four and six-cylinder cars manufactured by the Auburn Automobile Company, Auburn, Ind.

The directorate of the new company is exceptionally strong, and numbers among its members some of the financially strongest men in Montreal. The officers and board are as follows: President, W. W. Butler, vice-president of the Canadian Car & Foundry Company; vice-president, H. A. Dorsey, president of the Dominion Park, Limited; L. H. Timmins, president of the Hollinger Gold Mines, Limited; N. A. Duncan, general manager of the Canadian Car & Foundries, Limited; F. A. Skelton, secretary and treasurer of the Canadian Car & Foundries Company, Limited; W. Carruthers, of James Carruthers & Company, grain merchants; L. J. Perron, attorney.

The sales organization is under the charge of two experienced and well-known automobile men, J. Scott Innes and G. C. Murray.

New Jersey To Use Convicts on Roads

The conversion of New Jersey, a northern state, to the plan of prison labor will be of much interest to all good roads promoters of the country. For several years some of the southern states have been employing convict labor almost exclusively on road work, but in many of the northern states the plan has met with more or less opposition.

Col. Edwin A. Stevens, state road commissioner of New Jersey, after one season's trial of convict labor on the roads of his state, is enthusiastic in indorsing the policy generally. In a communication to the A. A. A. National Good Roads Board the commissioner writes:

"The experiment of convict labor on state roads, which was proved to be a success in one week, is only the beginning of good road building beyond what we already have and at a price which will spread out the money of the state beyond its present confines."

Minnesota Has 28,700 Automobiles

MINNEAPOLIS, MINN., Jan. 13—In 1912, 28,700 automobiles were registered by owners in Minnesota. This is an increase of 17,075 over 1910 and 9,425 over 1911. This increase at an average price of $1,000 a car means that $9,425,000 has been spent by Minnesota people in buying new cars in the year just closed. R. B. Anderson, Minneapolis, publisher of the State official automobile guide, reports that registration is continuing rapidly in 1913. His figures are as follows: 1910, 11,625; 1911, 9,275; 1912, 28,700. Beginning in 1912, automobile license tags were issued for 3 years each at $1.50 for the 3 years. The State book of licenses was issued June 1 and monthly bulletins have been issued since that time to keep the list up to date for subscribers.

Delaware Needs Automobile Commissioner

WILMINGTON, DEL., Jan. 13—Governor Pennewill, in his biennial message to the General Assembly, recommending the establishment of a state commissioner of motor vehicles, whose duty it shall be to issue the licenses for all motor vehicles and their operators and have general supervision over the use of such vehicles in the state. The chief object, aside from relieving the secretary of state of the duty of issuing the licenses, being to provide a state officer who can give direct attention to the enforcement of the law.

Franklin Men Meet at Factory

SYRACUSE, N. Y., Jan. 11—A conference of Franklin Pacific Coast dealers was held at the Franklin factory Friday, January 10, with John F. McLain, Pacific Coast district manager, presiding. Among those present were Ralph C. Hamlin, of Los Angeles, Cal.; Louis Normandin and F. B. Campen, of San José, Cal.; W. M. McCormach, of Pendleton, Ore.; R. H. Tuttle, of Walla Walla, Wash., and J. A. Nichols, Jr., of North Yakima, Wash.

Other Franklin men who attended the conference were C. H. Rockwell, Cleveland district manager; F. H. Sanders, Cincinnati district manager; W. J. Marshall, of Detroit, Mich.; J. J. O'Keefe, of Wheeling, W. Va.; A. Auble, Jr., of Akron, O.; Guy L. Smith, of Omaha, Neb.; S. C. Crane, of Dayton, O.; Murray Carr, of Pittsburgh, Pa.; O. C. Belt, of Columbus, O., and W. G. Langley, of Dallas, Tex.

After the conference the Pacific Coast men went to New York to attend the automobile show.

PIERRE, S. D., Jan. 12—The Good Roads League of South Dakota is going to push its plans before the State legislature. It will ask that convict labor be employed on State highways; that the good roads fund be increased by converting $40,000 now in the State game fund to the good roads fund; that the income from taxing automobiles be turned into the good roads fund and that the annual license fee be increased.

New York Club Formed

Aim Is To Provide Social and Protective Connection Between Automobile Owners in the City

Concerted Action To Be Taken for Saner Municipal and State Legislation—Three Types of Membership

IN order to provide social connection between automobile owners of New York City and to unite them for concerted action in support of the various organizations which are now working for saner city and state legislation, the Automobile Club of New York has been organized, with temporary headquarters at 1737 Broadway. Other aims of this club are to stimulate the public interest in automobile matters and bring about a closer relation between automobile users and trade.

The temporary headquarters contain the offices, lounging and reading rooms, but the permanent accommodations on Columbus Circle, which will be ready by September next, will include, besides these rooms, assembly and exhibition halls, dining and sleeping rooms, gymnasium, swimming pool and roof garden.

It is expected that the club will have a membership of several hundred automobilists shortly, judging by the great interest which is being taken in this matter by New York users of cars and trade members. Some of the most prominent people of New York, interested in the automobile business, have taken out memberships so far. There are three types of memberships, the founder membership limited to 500, at $25 a year, membership for New York City residents at $50 a year and out-of-town membership at $25 a year.

Motor Boosters Dine—The Big Village Motor Boosters' Dinner was held Tuesday evening in New York City. It was attended by about 300 enthusiasts, many who were from out of town. The Hoosier State was well represented.

Wisconsin's Governor on Automobiles

MADISON, WIS., Jan. 14—For the first time in the history of Wisconsin, the automobile, its use, operation and the consequences thereof received treatment in the biennial message of the governor of Wisconsin, at the opening of the 1913 Wisconsin Legislature on January 9 at the Capitol buildings in this city.

The governor arrives at the conclusion that after all the proper theory of taxing motor cars is on the basis of the effect their use and operation may result in by reason of wear and tear on roads. Thus, he suggests, the present uniform license fee of $5 per car per year be changed so that owners be required to pay a fee based on the weight or horsepower, the lightest cars to pay a minimum and the heaviest and highest-powered cars to pay a maximum fee.

The proceeds of this tax, the governor says, should accrue to the state highway fund, instead of being parcelled out *pro rata* to the county as at present, so that there may be more intelligent and efficient work in the direction of constructing and maintaining lines of traffic in continuity, to connect the principal villages and cities of the state and eventually result in a system of state highways.

The employment of Wisconsin convicts in the building of permanent highways is urgently advocated by the governor.

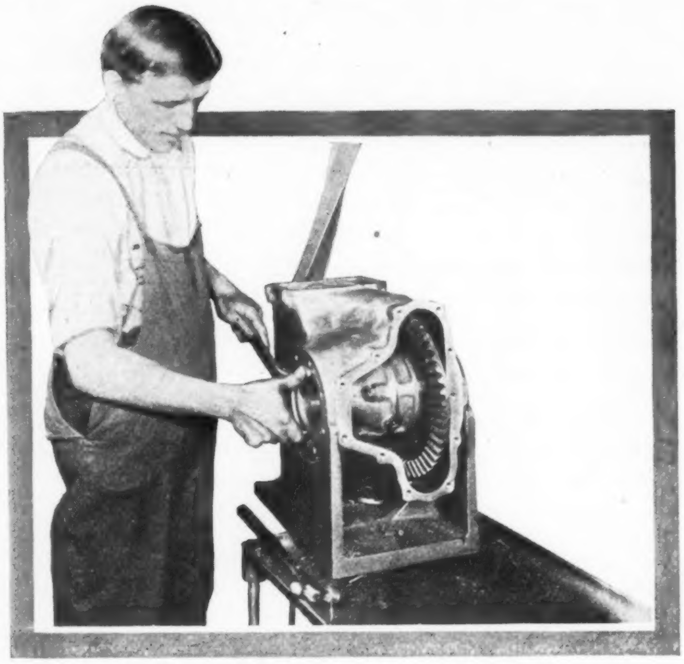
Corrections on Electric Issue—In the Electric issue of THE AUTOMOBILE, January 2, captions were transposed on two photographic reproductions of the Ohio electric cars. The photograph at the lower right, page 15 should have appeared as "Ohio Straight Line Brougham. Price $3,200," and that in the lower left corner of page 17 as Ohio Semi-colonial Brougham, $2,900.

In the January 2 issue of THE AUTOMOBILE, page 18, the statement was made that the Bailey long roadster presented last year has not been continued. This roadster has been continued for the coming season and is equipped with 60 A-4 or 52 A-6 cells of Edison battery. It has a mileage radius of 80 to 100 and a speed of 25 miles per hour. The controller gives six forward and four reverse variations. This vehicle is fitted with 33 by 4-inch pneumatic tires. It is fitted with wheel steering and mechanical brakes located on the rear axle and countershaft.

On page 1236, in the issue of THE AUTOMOBILE for December 12, the Locomobile line for 1913 is described. In the table giving the motor dimensions models M and R are transposed. In the description of the big six, which is model M, the principal motor dimensions should read: bore, 4.5 inches; stroke, 5.5 inches; wristpin diameter, 1.125 inches; connecting rod length, 12 inches. The horsepower and torque curves of the model M motor are given on page 1238. The oiling system as described on page 1237 is for the four-cylinder, 30-horsepower motor. On the six-cylinder cars, the oil is pumped independently to the main bearings and to the splash troughs.

Franklin Pacific Coast dealers who met in conference at the factory in Syracuse, N. Y., January 10

Factory Miscellany



Some of the manufacturing operations which are most expensive, both in time and money, are those little steps toward the perfected mechanism which are least in the limelight. The picture shows a workman adjusting the bearing in the differential of a White 1.5-ton truck so that the gears will mesh perfectly when the parts are assembled

KEETON Purchases Factory—The Keeton Motor Company, Detroit, Mich., has purchased the automobile plant formerly occupied by the Oliver Motor Car Company, paying $50,000. Immediate plans to enlarge the factory were started and work will be commenced upon the additions at once. The factory buildings, of which there are four, are located on 1¼ acres of ground. In the group are three buildings of modern factory construction 220 feet by 80 feet each and one building 140 feet by 80 feet. With other smaller buildings, the factory will comprise 50,000 square feet. The company's supplies for 1913 have been ordered and are being delivered at present. Active manufacturing started on January 17.

Speedway Plant Planned—The Speedway Tire Company, Louisville, Ky., is the name of a $250,000 concern which will establish a large factory in that city.

Dodge Brothers Award Contracts—Dodge Brothers, Detroit, Mich., manufacturers of automobiles, have awarded contracts for the erection of a new brick heat treatment building.

Reo Plant Completed—The Reo Motor Car Company, Lansing, Mich., advises that it is not in the market for equipment, as its new assembling plant has been completed and equipped.

General Vehicle's Factory—The General Vehicle Company, New York City, has plans for a large factory which will be erected in the automobile manufacturing district of Long Island City, N. Y.

Petersborough Establishes Factory—The Petersborough Machine & Lubricator Company, Ltd., Petersborough, Ont., recently incorporated at a capital of $600,000, will establish a plant for the manufacture of motors, etc.

New Concern Operates Plant—The plant of the American Automobile Manufacturing Company, New Albany, Ind., which failed some time ago, is to be operated by a new concern known as the Ohio Falls Motor Car Company.

Biggest Automobile Factory—What is declared will be the largest automobile factory in the world is shortly to be erected at Bridgeport, O., by the Bridgeport Auto Company, which has recently been organized with nominal capital of $5,000.

Ford's St. Louis Plant—The Ford Motor Car Company, Detroit, Mich., which recently began construction of an assembling plant at St. Louis, Mo., has bought additional ground for the enlargement of the plant as originally contemplated.

Amherst Firm Completes Plant—The Nova Scotia Carriage & Motor Car Company has completed a new four-story factory at Amherst, N. S. The main building is 300 feet by 100 feet. The office and power house are situated in separate buildings.

Cumberland's Pineville Factory—The Cumberland Motor Company is to establish a factory at Pineville, Ky., for the manufacture of a patented spring motor to be used in the operation of sewing machines. Machine tools are the principal items to be purchased.

Maritime's Coldbrook Plant—The Maritime Motor Car Company, St. John, N. B., is erecting a plant at Coldbrook, N. B., for the manufacture of automobiles. The buildings, two in number and each 250 feet by 100 feet, will be equipped with electrically-driven machinery.

Lee & Porter Building—The Lee & Porter Manufacturing Company, Dowagiac, Mich., is preparing to erect a frame addition to its plant, 32 feet by 90 feet. The installation of about $8,000 worth of machinery is also planned. The company expects to manufacture automobile axles on a large scale.

Gunn's Factory—The Gunn Motor Car Company, Utica, N. Y., has let a contract for additions to its plant, which will include a reinforced concrete building, 60 feet by 175 feet, two stories high, a kiln building 22 feet by 104 feet and a power plant 45 feet by 60 feet with a radial brick chimney 11 feet high.

Abbott Abolishes Factory Office—The management of the Abbott Motor Company has abolished the office of factory manager, the duties formerly attached to this position being divided between the general manager and the factory superintendent. G. C. Shoemaker continues as factory superintendent in charge of all production.

Akron Plant to Be Rebuilt—The International Harvester Company, Akron, O., which sustained the loss of several large buildings at its plant, after securing a promise from the city authorities, for better fire protection, announces that the plant will be rebuilt. The concern manufactures automobiles almost exclusively at the plant.

Jonas & Pimmat's Factory—Jonas & Pimmat, Syracuse, N. Y., have completed their new factory, which is of cement block construction, cement floors and steam heat, with electric lights at each workman's bench. The force of workmen will be doubled by spring. The company manufactures automobile accessories, including tonneau tops.

Albion's Canadian Factory—The Albion Motor Car Company, Ltd., of Glasgow, Scotland, has recently made arrangements with Montreal, Quebec, people to establish a factory garage for assembling commercial cars in that city, and it is intended in the near future to manufacture these cars in that country. There are some sixty Albion trucks running in Canada.

Purchases Vulcanizing Plant—The vulcanizing plant of the Canadian Consolidated Rubber Company, Vancouver, B. C., has been purchased by E. W. Starke. The plant is up-to-date and well equipped in every department. A vulcanizing plant equipped to handle everything in vulcanizing, retreading and tube work is part of the business. Besides there is machinery for putting on solid tires and other work of a similar nature.

Bridgeport Will Erect—The Bridgeport Auto Company, Wheeling, Va., will erect a factory.

McKinnon's Plant—The McKinnon Motor Vehicles, Ltd., Toronto, Ont., recently incorporated with a capital of $100,000 to manufacture automobiles, will establish a plant.

Aldis Briscoe Superintendent—Fred Aldis has been made superintendent of the Briscoe Manufacturing Company's plant in Detroit, Mich. He succeeds F. C. Farlinger.

Speedway's Factory—The Speedway Tyre Company, Louisville, Ky., recently incorporated, has selected three factory sites, and when one is selected an eight-story concrete building will be put up.

Streator Plant Sold—Pursuant to a decree of the United States District Court at Peoria, Ill., the plant, stock and other assets of the Streator Motor Car Company, Streator, Ill., was offered for sale at auction on January 14.

Cataract Rubber's Addition—The Cataract Rubber Company, headquarters at Buffalo, N. Y., plans to erect an addition to the Wooster, O., plant at which solid tires will be manufactured. I. C. Emery is the superintendent. The addition will be ready for occupancy May 1, and will cost $100,000.

Speedwell Adds Machine Shop—Stockholders of the Speedwell Motor Car Company, Dayton, O., ratified a plan to authorize a bond issue of $150,000 for extension of business. The Speedwell company will use Mead sleeve type of engine in place of the Continental or poppet type. A machine shop will be added to the plant.

Maxwell Factory Manager Leaves—Christian Pretz, for several years factory manager of the Maxwell-Briscoe Motor Company, was honored by a dinner at Tarrytown, N. Y., recently. The occasion was a sort of farewell affair to the employees of that plant, many of whom will remove to the Newcastle, Ind., plant, to which place most of the machinery already has been shipped.

Penn Sale January 21—The date of the sale of the Penn Automobile Company, near Newcastle, Pa., has been set for January 21. There are said to be two groups of men interested in the sale, one of which expects to continue the manufacture of automobiles, chiefly commercial vehicles; the other group would remodel the plant so as to make it suitable for other manufacturing purposes.

Assignee Sells Canadian Plant—The Harding Motor Car Company, Ltd., of London, Ont., which undertook to build cars in that Canadian city about a year ago, was sold by the assignee on January 14. The assets are appraised at $24,176, of which plant, machinery, patterns, tools and equipment are valued at $14,583.90, and stock in trade, which includes finished and unfinished parts, $9,190.71. The remaining $400 represents a demonstrating runabout.

Ford Ships 868 Cars—Enlargements on the Ford Motor Company's factory at Detroit, Mich., which have been under way for some months were completed shortly after the middle of December. As a result the output of the Ford factory has been enormously increased. In a single day, December 23, there were shipped from the Ford factory 868 cars, and during the month of December a total of 11,181 cars were produced by that company.

Three-quarter view of the plant of the Peninsular Steel Castings Company, Wight and Iron streets, Detroit, Mich. The company moved into the building shortly after its organization in November

The Automobile Calendar

Shows, Conventions, Etc.

Jan. 11-18.........Milwaukee, Wis., Annual Show, Auditorium, Milwaukee Automobile Dealers' Association.
Jan. 11-25.........New York City, Thirteenth Annual Show, Madison Square Garden and Grand Central Palace, Automobile Board of Trade.
Jan. 14.............Cleveland, O., Meeting, Chamber of Commerce Building, Cleveland Engineering Society.
Jan. 14............New York, Beefsteak Dinner, Big Village Motor Boosters.
Jan. 15............New York City, Banquet, Waldorf-Astoria, Motor and Accessory Manufacturers.
Jan. 15............New York City, Lunch and Meeting, Prince George Hotel, New England Motor Supply Jobbers.
Jan. 16............New York City, Meeting, Hotel McAlpin, Society of Automobile **Engineers.**
Jan. 16............ New York City, Dinner in Honor of W. H. Blood, Jr., Retiring President, Electric Vehicle Association of America, Delmonico's.
Jan. 17............New York City, Banquet, Hotel McAlpin, Society of Automobile **Engineers.**
Jan. 18-25.........Philadelphia, Pa., Annual Automobile Show.
Jan. 21-26.........Toledo, O., Annual Show, Exposition Building, Toledo Automobile Shows Company.
Jan. 25-Feb. 1.....Montreal, Que., Montreal Automobile and Truck Show, R. M. Jaffray, Manager.
Jan. 25-Feb. 1......Providence, R. I., Annual Show, State Armory, Rhode Island Automobile Dealers' Association, Inc.
Jan. 27-Feb. 1.....Philadelphia, Pa., Truck Show.
Jan. 27-Feb. 1.....Buffalo, N. Y., Annual Automobile Show.
Jan. 27-Feb. 1.....Detroit, Mich., Annual Automobile Show.
Jan. 27-Feb. 1.....Ottawa, Ont., Ottawa Motor Show, Howick Hall, Louis Blumenstein.
Jan. 27-Feb. 1..... Rochester, N. Y., Annual Show, Exposition Park, Dealers' Association.
Jan. 27-Feb. 1.....Scranton, Pa., Annual Automobile Show, Hugh B. Andrews.
Jan. 27-Feb. 13....Troy, N. Y., Annual Show, State Armory, Troy Automobile Club.
Feb. 1-8...........Chicago, Ill., Annual Automobile Show, Coliseum and 7th Regiment Armory.
Feb. 3-8...........Washington, D. C., Annual Show.
Feb. 8-15..........Hartford, Conn., Annual Show, State Armory, Hartford Automobile Dealers' Association.
Feb. 8-15..........Minneapolis, Minn., Annual Automobile Show.
Feb. 10-15.........Chicago, Ill., Truck Show.
Feb. 10-15.........Winnipeg, Man., Show, A. C. Emmett.
Feb. 11-15.........Binghamton, N. Y., Annual Show, State Armory, Dealers' Association, R. W. Whipple.
Feb. 15-22.........Albany, N. Y., Annual Show, State Armory, Dealers' Association.
Feb. 15-22.........Newark, N. J., Annual Automobile Show, First Regiment Armory, New Jersey Automobile Exhibition Company.
Feb. 16-23.........Richmond, Va., Annual Show.
Feb. 17-22........Kansas City, Kan., Annual Automobile Show.
Feb. 18-19.........Madison, Wis., Annual Show, City Market Building, Dealers' Association.
Feb. 18-21.........Grand Forks, N. D., Annual Show, Auditorium, Dealers' Association.
Feb. 18-22.........Baltimore, Md., Annual Show, B. A. D. A.
Feb. 19-22.........Bloomington, Ill., Annual Show, Coliseum, McLean County Automobile Club.
Feb. 19-22.........Geneva, N. Y., Automobile Show, Armory, Louis Blumenstein.
Feb. 19-23.........New Orleans, La., Annual Show.
Feb. 19-27.........Topeka, Kan., Annual Show.
Feb. 20-22.........Canadaigua, N. Y., Automobile Show, Louis Blumenstein.
Feb. 22-Mar. 1.....Brooklyn, N. Y., Annual Show, 23rd Regiment Armory.
Feb. 24-27.........Kansas City, Mo., Truck Show.
Feb. 24-Mar. 1.....St. Louis, Mo., Annual Show.
Feb. 24-Mar. 1.....Memphis, Tenn., Annual Show.
Feb. 24-Mar. 1.....Omaha, Neb., Annual Automobile Show.
Feb. 24-Mar. 1.....Paterson, N. J., Annual Show, Paterson Automobile Trade Association.
Feb. 24-Mar. 5.....Cincinnati, O., Annual Show, Music Hall, Cincinnati Automobile Dealers' Association.
Feb. 25-March 1... Syracuse, N. Y., Annual Show, Syracuse A. D. A.
Feb. 26-Mar. 1.....Fort Dodge, Ia., Annual Show.
Feb. 26-Mar. 1.....Glen Falls, N. Y., Automobile Show, Louis Blumenstein, Manager
Feb. 27-Mar. 1.....Toronto, Ont., Annual Show, Toronto Automobile Trade Association.
March 3-8......... Bridgeport, Conn., Show, Park City Rink, B. B. Steiber.
March 3-8..........Pittsburgh, Pa., Annual Automobile Show.
March 3-18........Des Moines, Ia., Annual Show, Pleasure Car Section, Coliseum, Dealers' Association.
March 5-8.........Tiffin, O., Annual Show, Tiffin *Daily Advertiser.*
March 8-15.........Boston, Mass., Annual Automobile Show.
March 12-15.......Ogdensburg, N. Y., Automobile Show, Louis Blumenstein, Manager
March 12-15.......Louisville, Ky., Annual Show, Dealers' Association.
March 19-26.......Boston, Mass., Annual Truck Show.
March 20-24.......New Orleans, La., Annual Show, N. O. A. D. A.
March 24-29.......Indianapolis, Ind., Annual Automobile Show.

Race Meets, Runs, Hill Climbs, Etc.

May 30............Indianapolis, Ind., 500-Mile Race, Speedway.

News of the Week Condensed

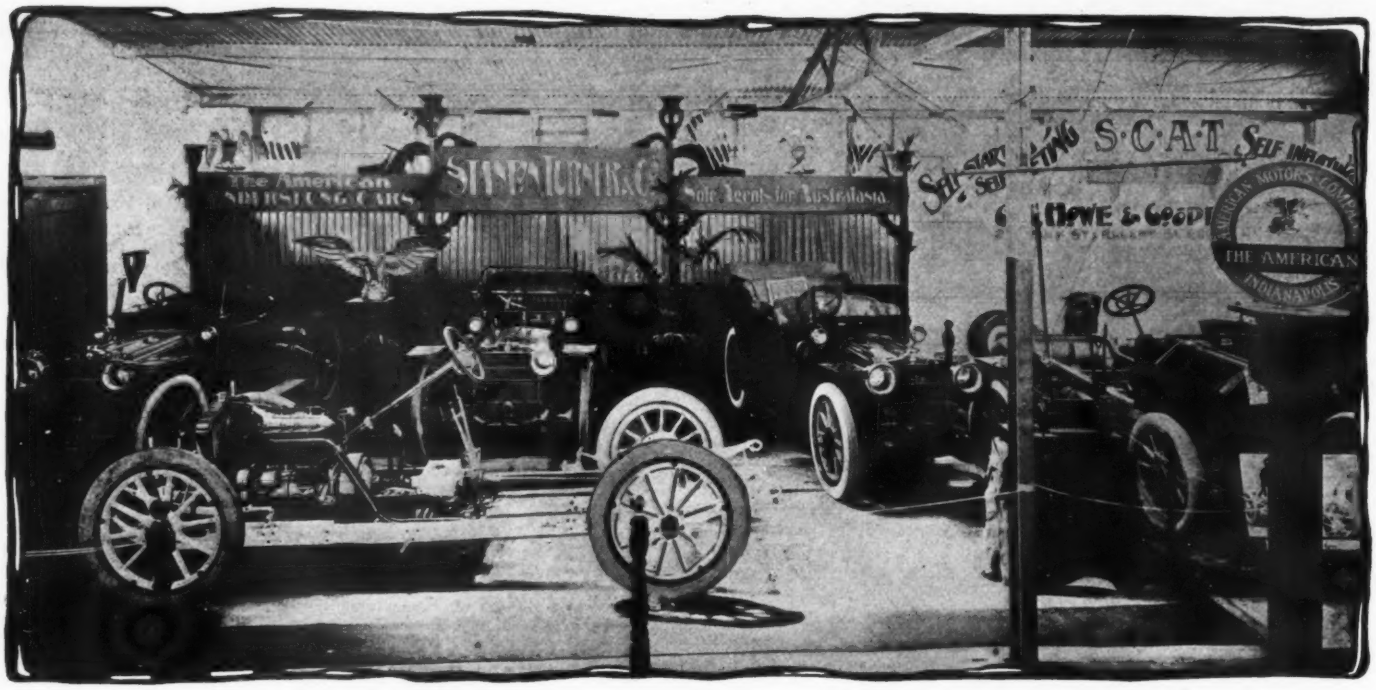


Exhibit of the American Motors Company at the recent automobile show held in Sydney, Australia

AMERICAN'S Australian Exhibit—An evidence of the growing popularity of the American cars abroad, was the exhibit of the American underslung, made by the American Motors Company, Indianapolis, Ind., in the automobile show held recently in Sydney, Australia. Three models, the Traveler, Tourist, and Scout and a chassis were exhibited.

New Columbus Tire Concern—The Columbus, O., Auto Tire Company is the name of a new concern which has opened a vulcanizing and retreading concern. H. R. Anderson is president of the company.

Columbus Supply House Opened—The Automobile Supplies Company is the name of a new concern which has opened in Columbus, O., to handle a full line of automobile supplies. C. S. Holmes is manager.

U. S. Tire's Columbus Branch—The United States Tire Company has opened a Columbus, O., branch located at 89 North Third street. B. L. Crippen, formerly connected with the J. C. Sherwood Rubber Company, is manager.

Syracuse Show Date Changed—Manager Harry T. Gardner, of the Syracuse, N. Y., automobile show, announces to the press and class publications that the official date of the show has been changed from February 25 to March 1, instead of the later date as first selected.

Woodhull Sales Manager—R. S. Woodhull who was manager of the horse-drawn vehicle department of the Columbus Buggy Company, of Columbus, O., has resigned to accept the position of general sales manager of the Ohio Electric Company, of Toledo, O., manufacturer of electric cars.

To Handle Knox Trucks—The Canadian General Electric Company, with head offices in Toronto, Ont., has completed arrangements with the Knox Automobile Company, of Springfield, Mass., to handle the Canadian sales of commercial vehicles and fire apparatus manufactured by the latter company.

Thomas Company Moves—The C. E. Thomas Company, Columbus, O., agent for the Studebaker line of cars, has moved its sales rooms and service department from 264 North Fourth street to a new structure at 166 North Fourth street. The new rooms are 25 by 180 feet and are equipped with a modern repair shop.

Hayes with Abbott—John A. Hayes, formerly connected with the sales department of the Lyon Motor Car Company and United States Motor Company, Detroit, Mich., has been appointed special sales representative for the Abbott Motor Company and left this week for northwest Canada where he will spend some time looking after the company's interests.

Cost of Maintenance High—The Baltimore, Md., authorities are trying to devise a plan to reduce the annual cost of maintenance of the four motor cars used by the Sewerage Commission, water department, city engineer department and street cleaning department which the past year reached close to $12,000. The officials blame improper handling for the high cost and will try to rectify this waste.

California Invests $58,230,000—At the close of business December 31, 1912, the records of Secretary of State Jordan's office shows how California invested approximately $58,230,000 in automobiles and leads the continent in the number of motor cars proclaimed during the past 12 months. The approximate revenue from motor vehicles for 1912 will amount to $75,000. This is an increase of $25,000 over 1911.

Dissolution of Columbus Concern—Dissolution of the Columbus Motor Car & Transportation Company, of Columbus, O., and the distribution of the funds is asked for in a petition filed in court recently by the thirty stockholders of the concern. It is alleged that the company failed to accomplish its purpose which was to compete with the street car company during the strike in Columbus several years ago.

Peculiar Washington Ruling—When the motor of an automobile stops on a railroad crossing and the owner runs up the track 1,000 feet to meet an oncoming train, striking matches, waving his arms and trying to attract the attention of the engineer, the railroad company must reimburse him to the value of the car if the engineer pays no attention and the train demolishes the vehicle. Such was the decision of the Supreme Court of the State of Washington in sustaining the decision of the Pierce County Superior Court in favor of John Nicol against the Oregon-Washington Railroad and Navigation Company.

New Agencies Established During the Week

PLEASURE CARS

Place	Car	Agent
Aledo, Ill.	Moon	E. B. Miller.
Butte, Mont.	Lozier	Motor Car Distrib. Co.
Calgary, Alta.	Cole	Central Gar. & Mach. Shop.
Carcall, Ia.	Moon	Swaney Auto. Co.
Columbus, O.	Detroiter	Frank Corbett.
Columbus, O.	Empire	S. W. Schott & Co.
Columbus, O.	Cameron	M. Cameron.
Davenport, Ia.	Lozier	Hawkeye Motor Co.
Des Moines, Ia.	Crow-Elkhart	Bothne Motor Co.
Des Moines, Ia.	Imperial	Bothne Motor Co.
Des Moines, Ia.	Richmond	Capital City Carriage Co.
Des Moines, Ia.	Royal	Bothne Motor Co.
Edmonton, Alta.	Cole	International Motor Co.
Hannibal, Mo.	Moon	Long Mfg. Co.
Hartford, Conn.	Lozier	H. D. Graves.
Indianapolis, Ind.	Broc	Treat & Warren.
Lima, O.	Cole	Thomas Motor Co.
Memphis, Tenn.	Moon	Chickasaw Motor Car Co.
Montreal, Ont.	Hupmobile	V. O. Reed.
Montreal, Ont.	Atlas	V. O. Reed.
Montreal, Ont.	Brockville	V. O. Reed.
Montreal, Ont.	Speedwell	V. O. Reed.
Orange City, Ia.	Moon	Aerrote Van Der Wilt.
Petersburg, Va.	Moon	W. P. Atkinson & Co.
Phœnix, Ariz.	Auburn	D. E. Nelson.
Phœnix, Ariz.	Chalmers	A. Ainsworth.
Phœnix, Ariz.	Ford	Ed Rudolph.
Prescott, Ariz.	Buick	Massing Bros.
Prince Albert, Sask.	Cole	Broadfoot & Manville.
Regina, Sask.	Cole	H. A. Gordon.
Taylor, Tex.	Moon	Prewitt Auto Co.
Tiffin, O.	Studebaker	H. P. Klaiss & Co.
Wakefield, Nebr.	Moon	Utecht & Eimer.
Wilkes-Barre, Pa.	Moon	Regal Sales Co.

Abbott Moves—The Abbott Motor Sales Company, Toledo, O., has moved to 1420-22 Madison avenue.

One County Without Automobile—There is only one county in Alabama without an automobile. This is Winston county.

Hermes Builds First Car—The Hermes Motor Car Company, Cincinnati, O., has built its first car. It will be sold for $1,700.

Biddeford Moves—The Biddeford Motor Mart, Biddeford, Me., is now located at 305 Main street. It will handle the Studebaker cars.

Bunnell Moves—The Bunnell Auto Sales Company, Toledo, O., has moved from Erie street into new quarters at 1416 Madison avenue.

Eisenman Branch in Detroit—A Detroit, Mich., branch has been opened by the Eisenman Magneto Company, Germany, at 802 Woodward avenue.

Guatemala's New Decree—By a recent presidential decree all invoices for goods to enter Guatemala must be accompanied by the bill of lading.

Stewart Sales Manager—L. I. Stewart has accepted a position as sales and advertising manager of the Warner Manufacturing Company, Toledo, O.

MacFarland in New Home—The MacFarland Auto Company, Denver, Colo., has moved to 25 Colfax avenue. Its new home is 72 feet by 182 feet.

McCann Secures Faurote—F. L. Faurote has accepted a position with the McCann Advertising Agency, Detroit, Mich., as head of the copy department.

Alabama's Improved Roads—During 1912 the Alabama state highway commission had actual charge of the construction of 118 miles of improved roads.

Gardner Manager Syracuse Show—Harry T. Gardner will manage the annual Syracuse, N. Y., automobile show in place of W. R. Marshall, who has removed to Calgary.

Add to Delivery Equipment—Six automobiles have been added to the delivery equipment at the New Orleans, La., postoffice due to the added business caused by the parcel post.

Quarles Opens New Quarters—The E. B. Quarles Company, Baltimore, Md., representing the Brown scientific pneumatic inner tube, has opened new quarters at 1922 North Charles street.

Syracuse Federal Moves—A. J. Jackson, Syracuse, N. Y., agent for Federal motor trucks, has moved from No. 511 S. Clinton street to No. 571, the same street, thereby doubling his show space.

Conducted on Dealership Basis—The Baltimore, Md., branch of the Franklin Automobile Company, Syracuse, N. Y., has been taken over by W. F. Kneip who will conduct it on a dealership basis. Mr. Kneip is a former Franklin engineer.

Ohio's Convict Labor—Advocates of good roads in Ohio have held frequent consultations with the Ohio State Board of Administration recently with reference to using convicts confined in the Ohio penitentiary for road improvement during 1913.

Oppose Passage of Law—Automobilists in Ohio are preparing to oppose the passage of a law by the legislature, changing the system of registration fees from a flat rate for electrics and gasoline cars, to a sliding scale based on the horsepower of vehicles.

Randall Resigns—F. M. Randall on January 1 resigned as Detroit, Mich., manager of the Charles H. Fuller Company, in order to become associated with Gleeson Murphy in the general management of the middle west organization of the H. K. McCann Company, advertising agents, with headquarters in the Boyer Building, Detroit, Mich.

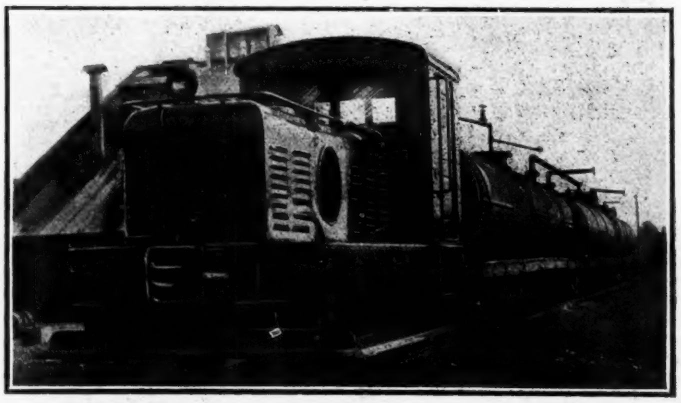
Studebaker's 10-Year Lease—The Studebaker Corporation has closed for a 10-year lease on a new five-story building at the corner of Peachtree and Harris streets, Atlanta, Ga., which will be used by its southern branch. The consideration is $150,000 for the 10 years.

Manitoba Highway Improvement—A report issued by A. McGillivray, highways commissioner for the province of Manitoba, shows that a sum of over $1,000,000 will be spent during 1913 on the highways of that province. One of the main travelled highways which will receive the greatest attention is that portion of Canadian territory between Winnipeg and the United States boundary line at Emerson.

Correction on Keeton—The Keeton Motor Company, Detroit, Mich., is not an outgrowth of the Croxton-Keeton Company except that Mr. Keeton formerly licensed the Croxton-Keeton Company to build a French type car of his design. The Keeton Motor Car Company makes only one chassis, a six-cylinder, 48-horsepower model, the monobloc motor having a 3.75 inch bore by 5.5 inch stroke with a four-bearing crankshaft. An electric starting and lighting system is fitted.

Pierson Appointed Receiver—Edward W. Pierson has been appointed receiver for the Indianapolis Dash Company, of Indianapolis, Ind., and has given bond in the sum of $25,000. The receiver was appointed on applications made to the superior court by the John Reilly Company and the E. H. McCormack & Sons Company, creditors in excess of $4,000. Several creditors have brought proceedings in the Federal Court to have the company adjudged bankrupt. Included in the liabilities are notes for $21,000 due Indianapolis banks.

Difficulty in Gasoline Contracts—The municipal authorities and other large users of gasoline in Indianapolis, Ind., are finding it difficult to place satisfactory contracts for gasoline for this year. The best figure that is being quoted is one-half cent off of the market price. In the past it has been possible to make contracts at from 9½ cents to 10½ cents a gallon, with the benefit of any reduction below the contract price. Most of the large users are now paying from 14 to 15 cents a gallon for gasoline, while some of the smaller users are paying from 18 to 20 cents a gallon.



The Baldwin Locomotive Company, Philadelphia, recently constructed four gasoline locomotives. The picture shows one of these fitted with a 6 by 6-inch four-cylinder motor and a Hele-Shaw clutch negotiating a 5 per cent grade with a load of 100,000 pounds

First view of the Collegiate Range, Continental Divide, coming into Buena Vista from Trout Creek Canyon, on top of Monarch Pass, crossing the Sangre de Christo Range of the Continental Divide; altitude, 12,000 feet

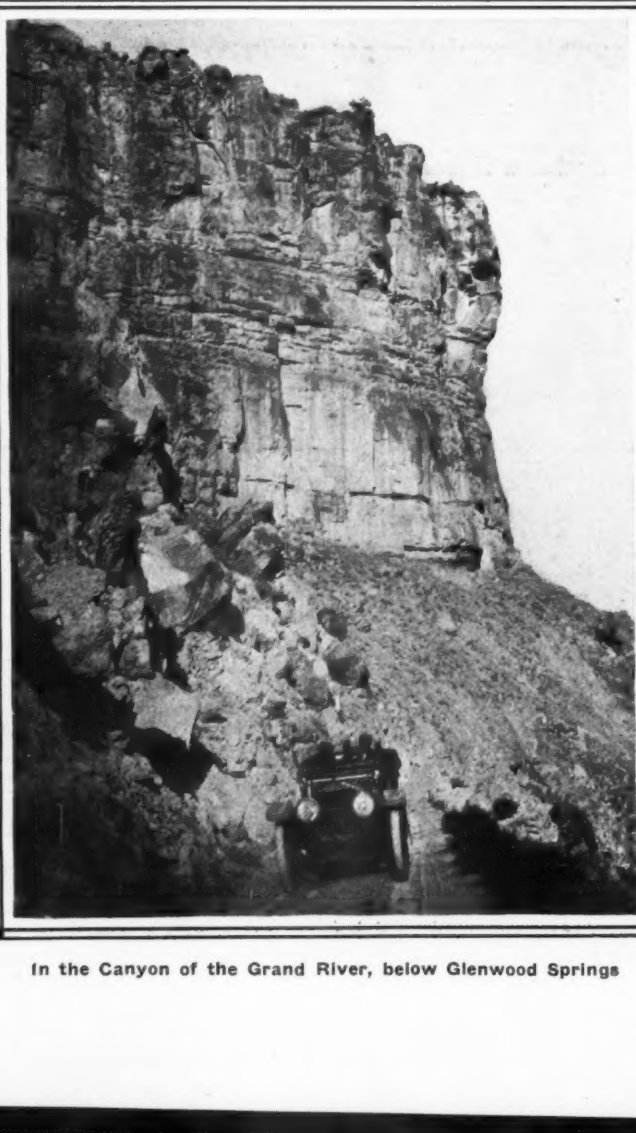
The illustrations shown herewith are made from photographs taken on a recent trip through Colorado in the six-cylinder White car, which is shown in the foreground of each of the pictures

St. Mary's Hose Truck—St. Mary's, O., will have a new motor hose truck, the purchase having been authorized by the city council.

Cary Sales Manager—The International Acheson Graphite Company, Niagara Falls, N. Y., has appointed Richard Cary sales manager of its lubrication department.

Marshall in Concrete Business—W. R. Marshall, secretary of the Syracuse, N. Y., Automobile Dealers' Association, will soon leave for Calgary, Can., to engage in the concrete construction business.

Winnipeg Adds Hose Wagons—Winnipeg, Man., has added two hose wagons to the fire department motor equipment. The latest additions are a Kisselkar and a Commer. Both machines have a capacity for 1,800 feet of hose and six men and are equipped with all the latest accessories for use in fire fighting.



In the Canyon of the Grand River, below Glenwood Springs

Formation of Co-Partnership—Alexander Muir and A. C. Davidson have formed a co-partnership under the name of the Muir-Davidson Steel Company, New York City, to act as general agents in the United States and Canada for the Samuel Fox & Company, Ltd., steel manufacturers of Sheffield, England.

Space at Winnipeg Show—The allotment of space for the Winnipeg motor show, Winnipeg, Man., provides space for twenty-six different exhibitors who will display at least sixty different makes of cars. The building will be most elaborately decorated and the show will be under the management of A. C. Emmett. The dates are February 10 to 15.

Change in Handling Electrics—The Union Electric Light & Power Company, St. Louis, Mo., has announced a change in its method of handling the electric automobile business. It has given up its agencies and will close its garage, as a public garage, just as soon as the customers can be accommodated elsewhere. The firms which the Union Electric Company has represented will shortly open places of their own, and in the future that company will act in an advisory capacity for the good of the business as a whole.

Automobile Incorporations

AUTOMOBILE AND PARTS

Boston, Mass.—Pope Manufacturing Company; capital, $6,500,000; to manufacture automobiles. Incorporators: S. L. Pope, G. Pope, R. P. Clapp.

Bridgeburg, Ont.—League of Canadian Automobilists, Ltd.; $5,000,000; to carry on the business of manufacturers, buyers and sellers of automobiles, motor vehicles and supplies, machinery, implements, etc. Incorporators: James Steller Lovell, William Bain, Robert Gowans, Joseph Ellis, Samuel Goodman Crowell.

Buffalo, N. Y.—Buffalo Automobile Sales Corporation; capital, $15,000; to manufacture and sell motors, engines, machines, etc. Incorporators: W. J. Harris, W. U. Heverly, Maud MacDonald.

Buffalo, N. Y.—F. A. M. Auto Supply Company; capital, $20,000; to deal in automobiles. Incorporators: F. A. Marburg, J. B. Green, R. H. Templeton.

Cleveland, O.—Anderson Rolled Gear Company; capital, $100,000; to manufacture and deal in machinery and supplies of all kinds. Incorporators: F. A. Barker, D. H. Foster, W. C. Krkkbride, H. N. Anderson, G. H. Sensabaugh, R. M. Calfee.

Cleveland, O.—Alco Motor Company; capital, $10,000; to deal in automobiles, trucks, parts, etc. Incorporators: M. Kluger, C. K. Halle, F. Butler, A. J. Halle, E. L. Geisner.

Cleveland, O.—Forest City Garage Company; capital, $5,000; to deal in automobiles and accessories. Incorporators: Christian Mortx, E. T. Mertz, J. T. Harding, J. W. Wald.

East Orange, N. J.—Rickey Machine Company; capital, $125,000; to deal in automobiles. Incorporators: C. A. Hauswirth, M. H. Rickey, F. A. Nott, Jr.

Louisville, Ky.—Standard Automobile Company; capital, $25,000; to deal in automobiles. Incorporators: G. A. Dunham, C. L. Alderson, J. H. Alderson.

Montreal, Que.—Grenier-Warrington Motor Car Company; capital, $50,000; to manufacture and deal in automobiles. Incorporators: Dr. E. Ostigny, Theopile Viau, J. T. Warrington, Aime Grenier, Hector Paiment.

Painesville, O.—Vulcan Manufacturing Company; capital, $300,000; to manufacture automobiles. Incorporators: E. B. Heartwell, F. H. Murray, J. C. Ward, Wm. Truby, H. E. Hammer.

Building $10,000 Garage—Edward Rudolph, Phoenix, Ariz., agent for the Ford, is building a $10,000 brick garage on East Adams street.

Motor Tractors at Baton Rouge—Motor tractors for farm use will be demonstrated at a farmers convention to be held in Baton Rouge, January 14 and 15.

Hartzell to Manage Goodyear—R. S. Hartzell has been appointed manager of the Cleveland, O., branch of the Goodyear Tire & Rubber Company, Akron, O.

Hutchinson Advertising Manager—F. B. Hutchinson, Jr., has been appointed advertising manager of the Kelly-Springfield Motor Truck Company, Springfield, O.

Firestone Opens Three Branches—The Firestone Tire and Rubber Company, Akron, O., announces the opening of three new branches in Cincinnati, O., Memphis, Tenn., and Milwaukee, Wis.

Inderrieden Sales Manager—A. J. Inderrieden has been appointed eastern district sales manager for the Stewart-Warner Corporation, Beloit, Wis., with headquarters in New York City.

New Orleans Anti-Noise—Open mufflers and oppressive forms of signalling devices on automobiles are to be prohibited by an ordinance now being compiled by the New Orleans, La., commissioner of public safety.

Fisk Opens Winnipeg Branch—The Fisk Rubber Company, of New York, will open on February 1 at Winnipeg, Man., a completely equipped branch house at 307 Fort street. Mr. R. Phillips will be in charge as local manager.

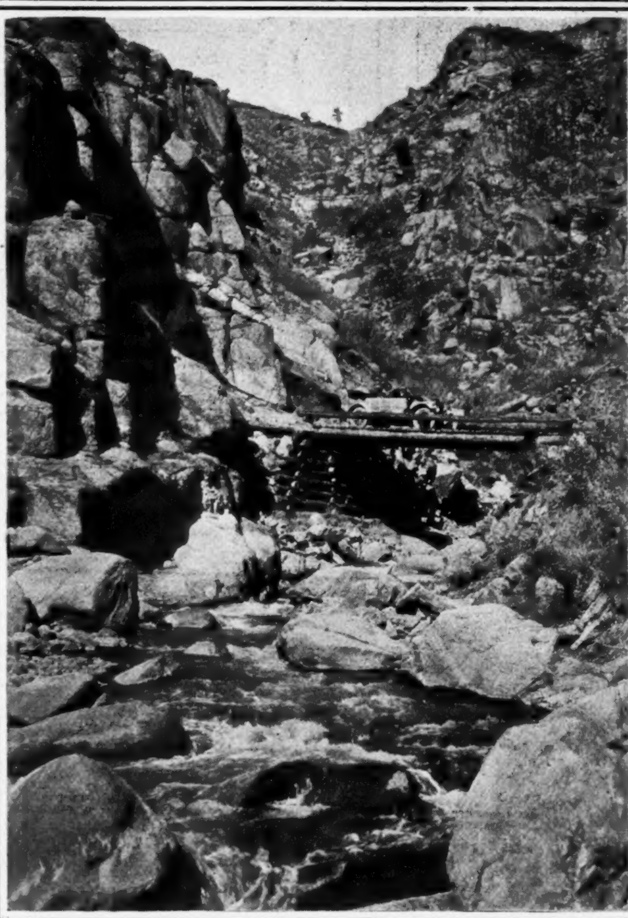
American Changes Name—Announcement has been made that the American Automobile Corporation, New Albany, Ind., has changed its name to the Ohio Falls Motor Car Company, and that the capitalization of the company is $450,000.

Roberts with Mais Truck—W. M. Roberts, sales manager for the Packers Motor Truck Company, Wheeling, W. Va., has resigned his position with that company, to accept a position with the Mais Motor Company, Indianapolis, Ind., as general sales manager.

Automobile in Eden—A movement to have the highways of the town of Eden, of which Bar Harbor, Me., is a part, reopened to automobiles, has been instituted. A bill introduced in the legislature provides that the town may open its roads to automobiles.

Ready Resigns from Lozier—W. J. Ready recently resigned his position as superintendent of the Lozier Motor Company, to become manager of the Star Motor Car Company, Ann Arbor, Me., which will manufacture trucks of 1,500 and 2,000-pound capacity.

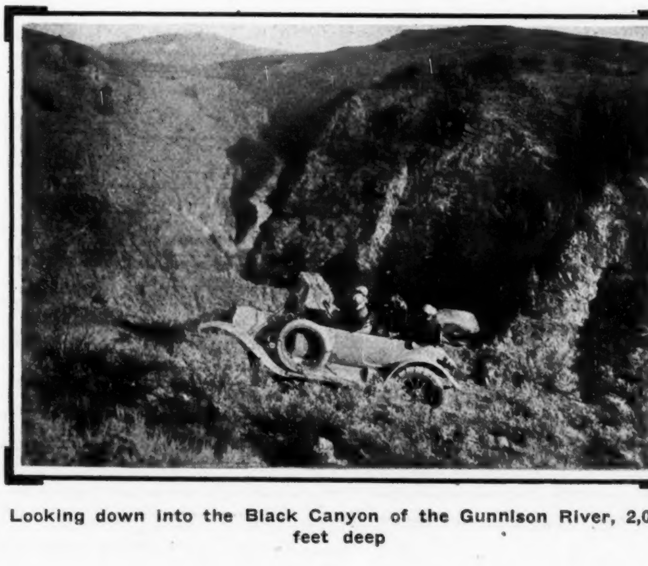
Lynn Show January 20—The Automobile Dealers' Association of Lynn, Mass., at its annual meeting recently voted to have an automobile show. This will be held during the week of January 20 to 25, at the Eighth Regiment Building. Percy I. Reynolds is secretary-treasurer.



In the Phantom Canyon of 4-Mile Creek, near Cripple Creek

Extends Invitation to Show Visitors—An invitation has been extended by the Miller-Brisben Company of West 63d street, to the out-of-town buyers during the week of the automobile show, extending to them the use of the available cars to facilitate the purposes of these visitors.

Broc Sales Increase—Among the announcements of 1912 sales increases, is one made by the Broc Electric Vehicle Company, Cleveland, O., of practically 100 per cent. for the entire year, and as an evidence of the increasing favor of electrics, may be cited the fact that the Broc management will again double its output of pleasure cars.



Looking down into the Black Canyon of the Gunnison River, 2,000 feet deep

Automobile Incorporations

PITTSBURGH, PA.—Keystone Motor Supply Company; capital, $12,000; to deal in automobiles.

TOLEDO, O.—Kero Carburetor Company; capital, $25,000; to manufacture and deal in carburetors, engines and parts and accessories. Incorporators: M. O. Rettig, W. J. Brunn, H. C. Lyon, Martha Arndt, W. C. Bugman.

GARAGES AND ACCESSORIES

BROOKLYN, N. Y.—Mol Stringer's Garage Corporation; capital, $10,000; to carry on a garage business. Incorporators: Mol Stringer, Jas. Culleeny, F. R. Huntington.

CLEVELAND, O.—Euclid Square Garage Company; capital, $25,000; to operate storage rooms for automobiles and to carry on a general livery business. Incorporators: C. K. Fauver, J. A. Pritchard, H. E. Downing, H. Allchin.

ELYRIA, O.—J. & H. Taxicab Company; capital, $2,500; to carry on a general taxicab business. Incorporators: A. L. Jackson, M. F. Harrison, L. B. Fauver.

LOUISVILLE, KY.—Speedway Tire Company; capital, $250,000; to manufacture automobile tires. Incorporators: H. L. Lewman, G. W. Greene.

TACOMA, WASH.—B. Bennett & J. B. Baldy; capital, $5,000; to conduct a garage, tire and vulcanizing plant. Incorporators: W. B. Shumacker, B. B. Bennett, J. B. Baldy.

TRENTON, N. J.—Empire Rubber & Tire Company; capital, $1,000,000; to manufacture and sell rubber hose, tires, etc. Incorporators: C. H. Baker, C. E. Murray, J. C. Murray.

CHANGES OF CAPITAL AND NAME

CLEVELAND, O.—Cleveland Auto Livery Company; increase of capital from $10,000 to $25,000.

CLEVELAND, O.—Stuyvesant Motor Car Company; decrease of capital stock from $200,000 to $10,000.

INDIANAPOLIS, IND.—American Automobile Corporation; change of name to the Ohio Falls Motor Car Company.

MOLINE, ILL.—Velie Motor Vehicle Company; increase of capital from $600,000 to $800,000.

Patents Gone to Issue

MECHANICAL WHEEL—In which the tire is supplanted by helical springs which take the place of the ordinary wooden spokes.

This patent refers to a wheel construction in which hub H and rim R, Fig. 1, are not connected by the ordinary type of spoke, but by telescoping spokes S containing helical springs S1. Each spoke is fixed at one of its ends to the hub H and at the other to a block which slidably engages the spoke-supporting elements E secured to the rim R. The helical spring which is contained in the telescoping spoke tubes of each spoke member is reinforced in its longitudinal direction by a rod R1 which projects through a slot in the aforementioned block.

No. 1,049,162—to John H. Sparks, Camden, N. J. Granted December 31, 1912; filed January 30, 1911.

Device for Tire-Tube Repairs—Which comprises two curved springs between which the inner tube is held in place.

Fig. 2 shows the subject matter of this patent, which serves for holding an inner tube in place while repairing it. For this purpose two curved spring members S are used, which are bent toward one another so that their convex faces are nearest along the median lines of both members. The tube is placed between both members S and by applying pressure by means of the wing nuts P, the inner tube is compressed.

No. 1,049,090—to Adolph R. Hoeft, Chicago, Ill. Granted December 31, 1912; filed October 3, 1910.

Automobile Carbureter—Consisting of two concentric float chambers which supply fuel through two separate vaporizing nozzles.

This device, Fig. 3, consists in principle of an outer wall O and an inner one, between which a central chamber C is formed which serves as the mixing chamber of the carbureter. Between the outer and inner walls is an intermediate wall which divides the space surrounding the mixing chamber into two independent, concentric chambers; floats F, F1 are in position in these chambers. Each float chamber has an independent supply pipe through which fuel flows into it, the flow being controlled by valves V and V1 for the float chambers containing floats F and F1, respectively. The valves are controlled by levers suitably fulcrumed at some place on the outer casing and moved by the rising or falling float. By means of nozzles M, which lead from the two float chambers into the central mixing chamber C, fuel is brought into the flow of air which is drawn into the motor by the suction of the latter and thereby vaporized.

No. 1,048,620—to Eugene B. Williams, Stockton, Cal. Granted December 31, 1912; filed May 8, 1912.

Clincher-Tire Rim—Consisting of two rim sections which are brought farther from or nearer to each other by an expansible hoop.

The rim construction described in this patent is shown in Fig. 4 and consists of two rim sections constructed as follows: Each section R is composed of a ring S at a right angle to the wheel axis and of one parallel to this axis. An inclined surface rising from the parallel ring to that which is at a right angle to the axis has its upper flange turned in so as to be capable of holding the bead of a clincher tire in place. An expansible hoop H lies between the two inclined parts of the rim sections and by its varying adjustment serves to space them.

No. 1,049,287—to Samuel Barnett, Tipton, Eng. Granted December 31, 1912; filed September 9, 1912.

Automobile Spring Suspension—Consisting in the use of short curved springs which counteract excessive deformation of the semi-elliptical spring.

The spring invention referred to in this patent is shown in Fig. 5. It consists of semi-elliptical leaf spring S1, the ends of which are attached to members M, while intermediate its length members N are secured to it. To each of these members N are fixed the free ends of a set of strongly curved springs L, the other end of the curved springs being secured to the chassis frame together with the ends of springs attached to the members M. It is clear that while the auxiliary springs do not interfere with normal spring action, they must prevent excessive deformation of the leaves of S1, as well as their recoil and consequent breakage.

No. 1,049,097—to George M. Huston, New York City. Granted December 31, 1912; filed August 7, 1912.

Resilient Automobile Tire—Consisting of a rigid rim and rigid spokes, resiliency being supplied by helical springs between the rim and tread.

The resilent tire described in this patent and shown in Fig. 6 consists of a rim and a tread band surrounding it concentrically. Rim and tread are resiliently spaced by means of a series of helical springs R which seat on projections formed on the rim and tread surfaces. The rim is formed in several sections the ends of which are formed with beveled faces engaging as do E and E1. The outward radial projections of E and E1 are held together by a suitable mechanism, such as a ring locked tight on these ends.

No. 1,049,067—to Otto Erickson and Olaf G. Sunden, Chicago, Ill. Granted December 31, 1912; filed February 17, 1912.

Carbureter Construction—Comprising a double evaporating chamber the parts of which come into action one after another.

This patent dealing with carbureter construction includes the combination of two vaporizing portions having a common outlet, with a throttle adapted to connect first one of the vaporizing portions and then both of them with the outlet. A fuel duct supplies the hydrocarbon fuel and a single valve is used to connect it first with one of the vaporizing and then with both, throttle and fuel regulating valve being operated simultaneously.

No. 1,046,014—to William H. Ratcliff, Newark, N. J. Granted December 3, 1912; filed September 7, 1910.

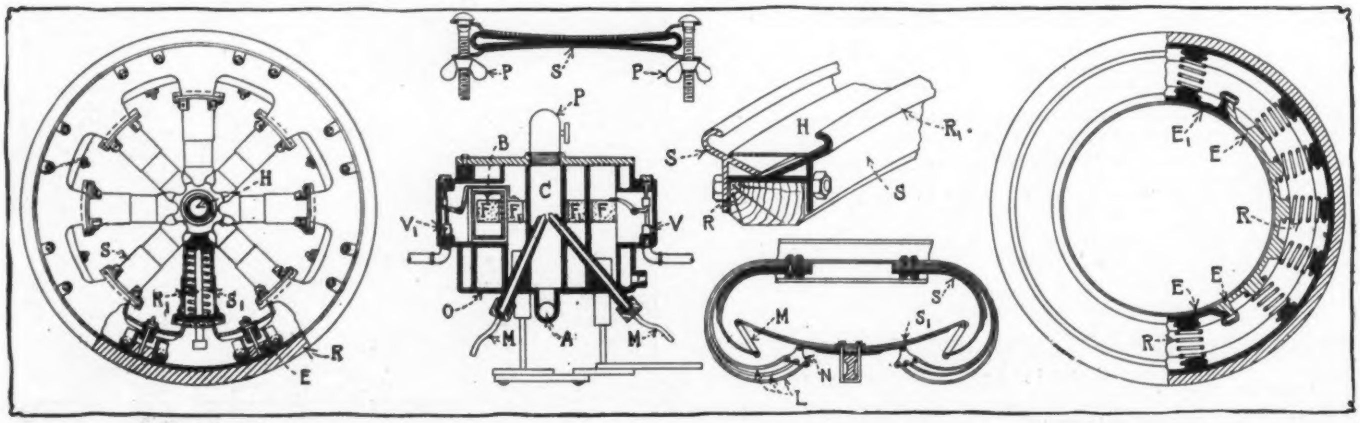


Fig. 1—Sparks mechanical wheel. Fig. 2—Hoeft tube-repair device. Fig. 3—Williams carbureter. Fig. 4—Barnett clincher rim. Fig. 5—Huston spring suspension. Fig. 6—Erickson-Sunden tire